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EASTERN ARCHIPELAGO PILOT
VOL. IV

COMPRISING
THE WESTERN END OF JAVA, THE SOUTHERN AND
EASTERN COASTS OF SUMATRA, SUNDA STRAIT, STRAAT
BANKA, GASPAR STRATEN, STRAAT KARIMATA, THE
WESTERN COAST OF BORNEO FROM TANJONG SAMBAR
TO THE ENTRANCE OF THE SUNGEI KAPUAS KECHIL,
RIOUW AND LINGGA ARCHIPELS, WITH THE VARIOUS
ROUTES LEADING TO SINGAPORE AND THE CHINA SEA

THIRD EDITION
1953

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To be filled in by Navigating Officer.

(In Chart Depôts the first two columns are alone to be filled up.)

Title.	Date of Publication and Number.	Date of insertion of Note in Margins of Book.

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This volume should not be used without reference to the latest Supplement and Annual Summary of Notices to Mariners affecting it which may have been published.

A Supplement to this volume will generally be published annually until the latter is again taken up for revision.

After the publication of Supplement No. 1, each succeeding supplement cancels the former.

Between the time of the volume being taken up for revision and the publication of the new edition no supplement will be issued, but early in each year a Summary of the Admiralty Notices to Mariners affecting the volume, which have been published during the preceding year, will be issued as a separate publication.

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The latest Supplement and any Annual Summary of Notices to Mariners that has been published affecting this volume will be obtainable gratuitously by purchasers of this volume from the Agents for the sale of Admiralty charts and other Hydrographic publications, on application either personally or by letter; in the latter case the cost of postage must be enclosed. For a list of these Agents *see* Admiralty Notice to Mariners No. 2, published annually.

Gt. Brit. Hydrographic Office,

EASTERN ARCHIPELAGO PILOT

VOL. IV

COMPRISING

THE WESTERN END OF JAVA, THE SOUTHERN AND EASTERN COASTS OF SUMATRA, SUNDA STRAIT, STRAAT BANKA, GASPAR STRATEN, STRAAT KARIMATA, THE WESTERN COAST OF BORNEO FROM TANJONG SAMBAR TO THE ENTRANCE OF THE SUNGEI KAPUAS KECHIL, RIOUW AND LINGGA ARCHIPELS, WITH THE VARIOUS ROUTES LEADING TO SINGAPORE AND THE CHINA SEA.

THIRD EDITION, 1953

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1953

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CAUTION.

IN THIS WORK THE BEARINGS ARE REFERRED TO THE TRUE COMPASS, AND WHEN GIVEN IN DEGREES ARE RECKONED CLOCKWISE, FROM 000° (NORTH) TO 359°.

THE BEARINGS OF LIGHTS ARE GIVEN FROM SEAWARD.

THE LATITUDES AND LONGITUDES GIVEN IN THE TEXT ARE APPROXIMATE.

THE DISTANCES ARE EXPRESSED IN SEA-MILES OF 60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO THE TENTH PART OF A SEA-MILE. IT IS OFTEN ACCEPTED AS BEING ONE-TENTH OF A NAUTICAL MILE.

THE DEPTHS ARE GIVEN BELOW CHART DATUM LEVEL WHERE NOT OTHERWISE STATED.

HEIGHTS ON THE LAND ARE GIVEN ABOVE MEAN LEVEL OF HIGH WATER SPRING TIDES.

FIGURES IN BRACKETS GIVEN AFTER THOSE DENOTING FEET, FATHOMS AND YARDS ARE THEIR EQUIVALENTS IN METRES.

TIME IS EXPRESSED IN THE FOUR-FIGURE NOTATION COMMENCING AT MIDNIGHT.

THE TERM "POWER VESSEL" USED HEREIN INCLUDES ANY VESSEL PROPELLED BY MACHINERY.

A NAME IN BRACKETS, IMMEDIATELY FOLLOWING ANOTHER NAME, IS THE OBSOLETE NAME WHICH IS STILL SHOWN ON THE ADMIRALTY CHARTS. AS A GENERAL RULE, THE BRACKETED NAME IS ONLY INSERTED IN THE DESCRIPTION OF THE PLACE OR OBJECT PREVIOUSLY BEARING THAT NAME.

WHEN SHADING IS USED TO INDICATE COLOURS OF FLAGS, TIDAL LIGHT SIGNALS, OR BEACONS, IT IS AS FOLLOWS:

▒	▥	▤	▧	■
Yellow.	Red.	Blue.	Green.	Black.

1562970

ADVERTISEMENT TO THE THIRD EDITION

The Eastern Archipelago Pilot, Volume IV, contains a description of the western end of Java, the southern and eastern coasts of Sumatra, Sunda strait, Straat Banka, Gaspar straten, Straat Karimata, the western coast of Borneo from Tanjong Sambar to the entrance of the Sungei Kapuas Kechil, Riouw and Lingga archipels, with the various routes leading to Singapore and the China sea.

Except for the Cocos islands and Christmas island, the description of the territory described in this work is derived from publications of the Netherlands Government; the latest information available from their surveys of this area is embodied in this edition.

This, the third edition, has been prepared by Commander H. P. Price, D.S.O., O.B.E., R.N., and contains the latest information received in the Hydrographic Department.

The meteorological information has been revised by the Meteorological Office of the Air Ministry. Temperature is expressed in degrees Fahrenheit, rainfall in inches, speed in knots, and distance in sea-miles, unless expressly stated otherwise. Information received from meteorological services which do not use these units has been converted into the units mentioned above by the Meteorological Office.

Mariners and others are invited, in the interests of navigation, to forward to the Hydrographer, Admiralty, Oxgate Lane, Cricklewood, London, N.W.2, any information that may come under their notice, which would be useful for the correction of the charts and other Hydrographic Publications issued by the British Admiralty; *early* advice as to newly discovered dangers, the establishment of, or changes in, any aids to navigation, is specially requested.

Copies of a form (H. 102) on which to render information can be obtained gratis from the Hydrographer of the Navy, Hydrographic Supplies Establishment, Creechbarrow House, Taunton, Somerset, or from any of the Admiralty Chart agents in Great Britain and abroad, a list of whom is published, annually, in Admiralty Notice to Mariners No. 2.

By the publication of this volume, the second edition of the Eastern Archipelago Pilot, Vol. IV, 1939, and Supplement No. 8, 1952, are cancelled, and all information affecting that work contained in Notices to Mariners up to and including No. 739 of 1953, has been embodied in this volume. For Temporary and Preliminary Notices to Mariners affecting this edition, the list of Temporary and Preliminary Notices to Mariners in force, published monthly in the weekly edition of the Admiralty Notices to Mariners, should be consulted.

A. DAY,
Vice-Admiral,
Hydrographer of the Navy.

Hydrographic Department,
Admiralty, London,
28th March, 1953.

BIBLIOGRAPHY

The following works, other than British Government publications, have been consulted in the preparation of this edition :—

Zeemansgids voor de Oost-Indische Archipel, Decl. I, 1949, with Aånvullingsblad No. 4, 1953, has been used for the whole of this volume, except for the description of the Cocos islands and Christmas island.

Lichtenlijst van Indonesië, 1949, with Verbeterblad No. 1, 1950 and No. 3 en 4, 1951.

Statesman's Year Book, 1952.

Whitaker's Almanack, 1952.

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GLOSSARIES

OF WORDS OCCASIONALLY FOUND IN THE CHARTS AND SAILING DIRECTIONS

MALAY—ENGLISH

Malay	English
Aër, Air, Ajer, Ayer	Water, stream
Alangan	Bar
Arus	Current
Bahru	New
Bandar, Bĕndar	Port, trading town
Barat	West, western
Batang air	River
Bato, Batu	Stone, rock
Bĕndar	Port, trading town
Bĕsar	Large, great
Bĕting	Shoal
Bĕtung	Large
Bukit	Hill, height
Busung	Islet, large sandbank
Dalam, Dalĕm	Deep, depth, inside
Danau, Dano	Lake
Darat	Land, the interior
Djalan	Road, way, course
Djambatan	Bridge, gangway, jetty, mole
Djĕrnih	Clear, pure
Gĕlung	Channel over a bar, or, in a river
Gili	Islet, rock
Gosong, Gusung	Shoal, reef, islet, summit, mountain top
Gunong, Gunung	Mountain
Hitam, Itam	Black, dark
Idjau	Green
Kalĕr	North, northern
Kampong, Kampung	Village
Karang	Coral, reef
Kĕring	Dry
Kĕtjil, Kechil	Small, little
Kidul	South, southern
Kota, Kotŏ, Kuta	Fortified town
Kuala, Kuwala	Mouth of a river
Kulon	West, western
Kramat	Holy place, shrine
Labuan, Labuhan	Anchorage, harbour
Larangan	Prohibited
Laut	Sea, North
Lebar	Wide, broad
Lor	North, northern
Mĕndara	Minaret, watch-tower
Merah	Red
Muara, Muorŏ	Mouth of a river
Napu	Reef
Paja	Marsh, swamp
Pangkalan	Landing place
Pantjang	Pole, stake, pile
Parigi, Pĕrigi	Well, spring
Pasanggrahan	Government rest-house
Pasir, Pasie	Sand, sandbank
Pĕlabuan	Anchorage
Pĕrhĕntian	Rest-house
Pĕrigi, Parigi	Well, spring
Pinggir laut	Coast, seaboard
Pontjak	Summit, peak
Praja	Town
Prau	Boat, ship
Pulau	Island
Pulau-pulau	Group of islands
Pura, Puri	City, town
Putih	White
Ras	Head
Rawa, Rawah	Marshy ground
Rawang	Swamp; Gap
Rĕndah	Low
Riam, Rijam	Waterfall, rapid
Rimba, Rimbŏ	Virgin jungle
Rumah	House
Sawang	Narrows, strait
Sĕlat	Strait, channel, narrows
Sĕlatan	South, southern
Sumber	Spring of water
Sumur	Well (water)

MALAY—ENGLISH—*continued*

Malay	English	Malay	English
Sungai, Sungei	River	Tjandi	Shrine, monument
		Tjetek	Shallow
Taka, Takat	Shoal, reef, rock	Tokong	Rocky treeless islet, large rock, shrine
Tandjong, Tandjung, Tanjong	Cape, headland, promontory		
Tasik	Lake	Trumbu	Reef which dries
Tĕlaga, Tĕlagŏ	Pond, well	Trusan, Tĕrusan	Connecting channel
Tĕlok, Tĕluk	Bay, bight		
Tĕnang	Calm, smooth	Tukuh, Tukoh	Islet
Tĕrusan, Trusan	Connecting channel	Udjung	Point, extremity
Timor, Timur	East, eastern	Ulak	Eddy, whirlpool
Tinggi	High, height, lofty	Utara	North, northern
Tinjau	Look-out		
Titian	Mole, jetty, footbridge	Wai, Waj	Stream, creek
		Wetan	East, eastern
Tjadi	Little, small		

Note.—The vowels OE in Indonesian names instead of the letter U will continue to appear on certain Admiralty charts pending revision.

DUTCH—ENGLISH

Dutch	English	Dutch	English
Archipel	Archipelago	Noord	North
Baai	Bay	Ondiepte	Shoal
Bank	Bank, shoal	Oost	East
Berg	Mountain	Oud	Old
Bocht	Bight		
Boom	Tree	Punt	Point, corner
Bosch	Forest, wood		
		Rede	Roadstead
Droogte	Shoal	Rif	Reef
		Rivier	River
Eiland	Island	Rood	Red
Eilandje	Islet	Rots	Rock, rocky islet
Gebergte	Mountain range	Schiereiland	Peninsula
Geul	Channel	Steen	Small rock, stone
Golf	Gulf	Straat	Strait
Groot, Groote	Great, large		
		Vaarwater	Channel, navigable water or fairway, passage
Heuvel	Hill		
Hoek	Cape, point		
Hoofd	Headland	Valsch	False
Hoog	High	Vlakte	Plain
Hout	Wood	Vulkaan	Volcano
Kaap	Cape	West	West
Klein, Kleine	Little, small	Wit	White
Klip	Rock, crag, cliff		
Kloof	Cleft	Zand	Sand
		Zandplaat	Sandbank, sand cay
Kreek	Creek		
		Zuid	South
Meer	Lake	Zwart	Black
Midden	Middle		

Note.—*Dj* in Dutch is to be pronounced as *j*, *ij* as *ai*, *j* as *y*, *oe* as *u*, *sj* as *sh* and *tj* as *ch*.

SYSTEM OF ORTHOGRAPHY

The following rules for the spelling of geographical names (termed the R.G.S. II system) have been adopted for British official use, and the names in Admiralty Hydrographic publications will be rendered in accordance with these rules as opportunity occurs.

In new editions of the various volumes of sailing directions names are, generally speaking, given in accordance with these rules, but where the name on the chart shows an older rendering of a name, such chart name is given in brackets after the new rendering and will also be given in the Index.

The rules for spelling in the R.G.S. II system are as follows :—

(1) The spelling of every place-name in an independent country or self-governing dominion using the Roman alphabet (including " Roman " alphabets containing extra or modified letters, such as Czech, Serb-Croat, Polish, Romanian, etc.) shall be that adopted by the country or dominion.

(2) In colonial possessions the spelling of such place-names as belong to languages coming under Rule (1) will be spelt in accordance with that rule.

(3) The accents and diacritical marks in official use by the above countries will be retained. Wherever it appears desirable, the pronunciation will be shown by giving the name as transliterated on the system below.

(4) All other place-names throughout the world will be spelled in general accordance with the following system.

The broad features of this system are

(*a*) That vowels are pronounced as in Italian and consonants as in English :

(*b*) That every letter is pronounced, and no redundant letters are used.

This system aims at giving a close approximation to the *local* pronunciation ; but it is recognised that in some languages, notably Russian, Greek, and Arabic, the necessity for letter-for-letter transliteration often renders this impossible.

TABLE OF SPELLING AND PRONUNCIATION R.G.S. II.

a	The long and short Italian vowels, as in *lāvă*	Somāli; Răvennă.*
ä	Between *a* in *fat* and *e* in *eh*?; chiefly in Teutonic and Finno-Ugrian languages	Mähring; Pärnu.
ai	The two Italian vowels, frequently diphthongal, almost as in *aisle*; but pronounced *ei* and *ĕ* in Greek names	Wadai; Shanghai.
au	The two Italian vowels; frequently diphthongal; almost as *ou* in *out*	Sakau; Bauchi.
aw	When followed by a consonant, or when terminal, as in *awl, law*	Dawna; Saginaw.
b	As in English.	
c	Not to be used, but always replaced by *k* or *s*; except in the compound *ch*, and in many conventionally-spelt words, as	Kandahar; Serang. Calcutta; Celébes.
ch	As in *church*; never *tch* or *tsch* for this sound	Chad; Kerch.
d‡	As in English.	
dh	Soft *th* as in *they*; a slight *d* sound sometimes preceding it in Semitic languages	Hadhramaut; Riyadh.
e	Long as in *eh*? short as in *bet*. (For the *e* sound in the French *je*, see note at end on the "neutral vowel.")	Gēlo; Mafĕking.*
(ee)	Used for *i* (*q.v.*) only in a few conventional names	Darjeeling; Keelung.
ei	The two Italian vowels, frequently diphthongal as in *rein*, but pronounced *i* in Greek names	Beirut; Raheita.
(eu)	Not used as a single sound.	
f	As in English; *ph* must not be used for this sound	Mustafa; Maidan-i-Naftun.
g	Hard, as in *get, gift*: never as in *gem, gin*	Gedáref; Gilgit.
gh	Soft guttural, the Arabic *ghain*	Ghadames; Baghdad.
h	Used only when sounded; or in the compounds *ch, dh, gh, kh, sh, th, zh*	Ahmadabad; 'Abdullah.
i	Long as in *marine*; short as in *piano*	Fiji; Kibonde.
j	As in English; except in transcription of Chinese, where it equals *zh*, or the French *j*	Juba, Ujiji (Eng. *j*); but Jaoping (Fr. *j*).
k	As in English; hard *c* should never be used (except in conventionally-spelt words)—thus, not Corea, Cabul, but	Korea; Kabul.
kh	Hard aspirated guttural, as in the Scottish *loch* (not as in *lock*)	Khan; Sebkha.
l‡ **m** **n‡**	As in English.	

*The long and short symbols given here are merely for explanation, not for use.

‡See note at end on *Liquid Sounds*.

ng	Has three separate sounds, as in *vanguard*, *finger*, and *singer*. If necessary to distinguish, a hyphen may be placed, as in *van-guard*, *singer-* ..	In-galla ; Bongo ; Ng-ami ; Tong-a.
ngg	May be used for the sound of *ng* as in *finger* ..	Trengganu ; Yanggang-a.
o	Long as in *both*¶ : short as in *rotund*	Kigōma ; Hŏnŏlulu *
ö	As in German ; equals the French *eu* in *peu* ; or nearly the English sound in *fur*	Barköl.
(oo)	Used for *u* (*q.v.*) only in a few conventional names, chiefly Indian and Chinese	Poona ; Foochow.
oi	The two Italian vowels ; frequently diphthongal as in *oil*, but pronounced like *i* in *fit* in Greek names	Hanoi.
öi	The diphthong as in French *oeil* and Norwegian *höi*	Höiland.
ou	Dissyllabic, and not as French or English *ou*, except in Greek names where it has the French value	Zlatoust ; Yaroua
ow	Used as a diphthongal combination of *ŏ* and *w* only in the romanisation of Chinese	Hankow.
p	As in English.	
ph	As in *loophole* ; not to be used for the *f*-sound, except conventionally	Chemulpho ; Haiphong.
q	Represents *only* the Arabic *qaf* and the Hebrew *qof* ; i.e. a guttural *k* (as a rule)	Qena ; Qiryath.
qu	Should never be employed to represent the sound of *kw* ; thus, not Namaqua, Quorra, but	Namakwa ; Kworra.
r	As in English ; should be distinctly pronounced.	
s‡	As English *ss* in *boss*, not as in *these* or *pleasure*	Burgos ; Masikesi.
sch	As in *discharge*	Peschanka.
sh **t‡**	As in English.	
th	Hard *th* as in *thick*, not as in *this* (except conventionally in Fijian)	'Athlith ; Thingvellir.
u	Long as in *rude*, or as *oo* in *boot* ; short as in *pull*	Zūlū ; Rŭanda.*
ü	As in German : equals the French *u*, as in *tu* (Fr.)	Üsküdar.
v **w** **x**	As in English.	
y	Always a consonant, as in *yard* ; it should not be used as a terminal vowel, *e* or *i* being substituted ; e.g. not Kwaly or Wady, but	Kikuyu ; Maya. Kwale ; Wadi.
z	As in *gaze*, not as in *azure*.	
zh	As the *s* in *treasure*, the *z* in *azure*, or the French *j* in *je* ; but for the sound in Chinese use *j* (*vide* note under *j*)	Zhob.

*The long and short symbols given here are merely for explanation, not for use.

‡See note at end on *Liquid sounds*.

¶The true Italian ō is broader than this ; almost as in *broth* (= R.G.S. II *aw*). The letter *o* is conventionally used for this sound in certain names in Nigeria, Tonga, etc. : e.g. Oyo, Fofoa.

NOTES.

The doubling of a vowel or a consonant is only necessary when there is a distinct repetition of the single sound, and should otherwise be avoided	Nuusafee; **Moorea**; Jidda; Muhammad.
Accents should not generally be employed; but in order to indicate or emphasise the stress, an acute accent may be used	**Saráwak**; **Q̣ántara**; Tong-atábu; **Paraná**.
A long or short mark over a vowel (e.g. ā, ŏ) should only be used (and that sparingly) when without it there would be danger of mispronunciation ..	Kūt; Kyōto; Abŏso.
Hyphens will not be used except to indicate pronunciation and with the particle *-i-* (in Persian, Fijian, etc.)	Ta-if; Pusht-i-Kuh; Nuku-i-Ra.

Inverted comma and apostrophe.—The inverted comma ‘ is employed only to represent the Arabic *‘ain*, the Maltese *‘ghain*, and the Hebrew *‘ayin*. The apostrophe ’ in foreign words indicates a liquid sound (*see* below).

Liquid sounds.—The occasional "liquid" or "palatalised" sound of *d, l, n, s, t*, etc. (as in *d'you, lure, new, pursue, tune*, etc.) is as a rule sufficiently represented by a following *y*; where, however, owing to a following consonant, or to the palatalised letter coming at the end of a word, the *y* is inapplicable, the liquid sound will be represented by an apostrophe, thus: *d', l', n', s', t'*, etc.

The "Neutral vowel."—The "indeterminate" or "neutral" vowel sound (*er*), i.e. the sound of *a* in *marine*, *e* in *often*, *i* in *stir*, *io* in *nation*, *o* in *connect*, *ou* in *curious*, *u* in *difficult*, etc., *e* in French *je*, or the often unwritten vowel (*Fat-ha*) in Arabic, etc., is represented as a rule by *a*: as in Basra, Hawiya; but sometimes by *e*, when the sound approximates more to *e* than to *a*: as Meshed, El Gezira.

(In any guide to pronunciation issued by the Permanent Committee on Geographical Names, the "neutral vowel" is represented generally by the italic *e*: occasionally also by italic *a* or *u*.)

This sound must not be confused with *e-mute*, where the *e* is not sounded at all: as in Abbeville.

Nasal vowels.—In illustrating the pronunciation of French, Portuguese, Polish, etc., nasal vowels, the nasalisation will be represented by italic *n*; as Czestochowa pr. Chā*n*stokhóva.

Note.—The Royal Geographical Society has published a book entitled "Alphabets of Foreign Languages transcribed into English according to the R.G.S. II system." This book enables the correct rendering of names to be obtained, also of names in languages which are transliterated letter for letter.

LAWS AND REGULATIONS APPERTAINING TO NAVIGATION.

While, in the interests of the safety of shipping, the Admiralty make every endeavour to include in their hydrographic publications details of the laws and regulations of all countries appertaining to navigation, it must be clearly understood :—

(*a*) *that no liability whatever can be accepted for failure to publish details of any particular law or regulation, and*

(*b*) *that publication of the details of a law or regulation is solely for the safety and convenience of shipping and implies no recognition of the international validity of the law or regulation.*

INFORMATION RELATING TO ADMIRALTY CHARTS AND PUBLICATIONS, GENERAL NAVIGATION, AND GENERAL METEOROLOGY.

ON THE CORRECTION OF ADMIRALTY CHARTS.

Guides to Navigation.—In addition to the charts, the navigational publications which are primarily affected by the continual changes and alterations that take place are the Admiralty Sailing Directions, the Admiralty List of Lights, Fog Signals and Visual Time Signals, and the Admiralty List of Radio Signals. The Admiralty Notices to Mariners contain information mainly for the correction of the charts and navigational publications.

CHARTS.

1. **Degree of Reliance.**—It should be clearly understood that the value of a chart depends on the character of the original survey and on the completeness of the reports of subsequent changes. The remarks on " The Use of Charts as Navigational Aids, &c." which are subjoined should be carefully studied in this connection.

2. **System of Dating and Issue of Corrected Copies.**—Admiralty charts after first publication are kept corrected by means of new editions, large corrections, and small corrections. Copies of charts issued by the Hydrographic Supplies Establishment, Admiralty Chart Agents or Admiralty Chart Depôts are corrected, except from temporary and preliminary Notices to Mariners, for all navigational information to the date of issue.

New Charts.—The date of publication of a chart is shown outside the bottom margin, in the middle, e.g. :—

Published at the Admiralty 30th May, 1947.

New Editions.—When a chart is revised throughout and modernised in style a new edition is published, the date being shown outside the bottom margin and to the right of the date of publication, e.g. :—

New Edition 2nd Jany., 1947.

All large and small corrections notations are at the same time erased, and all old copies of the charts are cancelled.

Large Corrections.—When a chart is corrected from important information which is too comprehensive to promulgate by Admiralty Notice to Mariners or to insert conveniently by hand on existing copies, but when the chart is not revised throughout, the date on which these corrections are made is shown on the chart outside the bottom margin and to the right of the date of publication, and in the case of a chart already marked with a new edition date, below such date, e.g.:—

Large corrections 10th Feb., 1947.

All small corrections notations are at the same time erased, and all copies of the chart are cancelled.

Small corrections.—

(*i*) When a chart is corrected from the information promulgated in an Admiralty Notice to Mariners (except temporary and preliminary Notices), the year, if not already shown, and number of the notice are entered in the bottom left-hand corner of the chart, e.g.:—

Small corrections 1947–*903.*

Copies of the chart stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents and the Admiralty Chart Depôts are corrected by hand from such information.

(*ii*) When a chart is corrected from information which is considered of no importance from the standpoint of safe navigation, and which is, therefore, not promulgated in an Admiralty Notice to Mariners, the year, if not already shown, and date of the correction are entered on the chart, in one of two ways, in the bottom left-hand corner below the margin and in sequence, with the notations referred to in the preceding paragraph, e.g.:—

Small corrections, 1947—$\boxed{5.20}$—

or Small corrections 1947—(VI.*25*)

These indicate that the chart received minor corrections on the 20th May or 25th June, respectively.

In such cases copies of the chart held by ships and establishments are not usually replaced by new copies, but in exceptional cases, e.g., when new compasses are inserted, new copies of the charts may be supplied. It should, however, be particularly noted that the absence of corrections represented by square or bracket dates from a chart does not invalidate it for navigation.

3. Correction of Charts in Ships.—All small but important corrections affecting navigation that can be made to the charts by hand are promulgated in Admiralty Notices to Mariners and, with the exception of corrections from temporary or preliminary Notices, should at once be neatly made in waterproof violet ink on the charts affected, the year (if not already shown) and numbers of the notices being inserted, also in waterproof violet ink, in the bottom left-hand corner of the chart. The recognised abbreviations shown on Admiralty chart No. 5011 ("Signs and abbreviations used on Admiralty Charts") should be used.

Generally speaking, the amount of information which should be inserted on a chart should be in accordance with that already shown.

On large scale charts, the abridged descriptions, as shown on chart No. 5011, of all details of all lights, light-buoys and fog signals, and the year dates of obstructions, reported shoals, dredged channels, depth on bars or in shifting channels, and irregularities of lights, should be inserted.

On coastal charts, the abridged descriptions of only the principal lights and fog-signals, i.e., those to assist in approaching or making the land, should be inserted.

Particulars of such lights should be omitted, in the following order, as the scale of the chart decreases, viz.:—

(i) Elevation, (ii) Period, (iii) Number in Group, and (iv) Visibility.

Particulars of fog signals should be inserted in their appropriate positions if space permits, but should otherwise be entered in a tabulated list under the title or some other convenient place on the chart.

Inner harbour light-buoys and beacons should not be inserted on coastal charts, and against other light-buoys only the character of the light should be inserted.

On ocean charts, lights which are visible 15 miles or over should alone be inserted and then only their character and colour.

On all charts, writing should be inserted as much as possible clear of the water, unless the relative objects are on the water, and care should be taken not to obliterate any information already on the chart. When cautionary or tidal notes, &c., are inserted, they should be written in a convenient but *conspicuous* place, preferably near the title, where they will not interfere with other details.

Erasures should never be made but the details should, when necessary, be crossed through in waterproof violet ink.

Admiralty Notices to Mariners are occasionally accompanied by reproductions of portions of charts (known as " blocks "), and when correcting charts from such blocks the following points should be borne in mind:—

(i) A block may not only indicate the insertion of new information, *but also the omission of matter previously shown.* The latter would, however, invariably be mentioned in the text of the Notice, and the fact that a block accompanies a Notice should not cause the text of the Notice to be disregarded.

(ii) The limiting lines of a block are determined for convenience of reproduction and need not be adhered to when cutting out for pasting on the chart, provided that the point mentioned in the preceding paragraph is taken into consideration.

(iii) The new information shown on a block can sometimes be inserted on the chart by hand, the reason for issuing a block in such a case being to avoid a long description of the new information in the text of the Notice.

(iv) Owing to distortion the blocks do not always fit the charts exactly, care should therefore be taken when pasting a block on to a chart that the more important navigational corrections fit as closely as possible. This can best be assured by fitting the block while it is dry and making two or three pencil ticks round the edges for use as fitting marks after the paste is applied.

Corrections from Temporary or Preliminary Notices to Mariners should be inserted on the charts *in pencil* and the year and number of the notice should be shown against them, e.g.:—N.M. 625/1947 temp., and also in the bottom left-hand corner of the chart, in pencil, *below* the small corrections notations (*see* above). Temporary corrections should be rubbed out when the notice is received cancelling them, but preliminary corrections should be inked in when the notice is received reporting that the changes have been made.

Charts stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents and the Admiralty Chart Depôts are *not* corrected from Temporary or Preliminary Notices to Mariners, and when charts are received from one of these sources they should be corrected in pencil as necessary from the copies of such Notices already held, or from those supplied with the charts.

Corrections from Radio Navigational Warnings concerning derelicts and drifting obstructions, the temporary extinction of lights, displacement of important aids to navigation, ice reports, &c., should also be noted *in pencil*, as received, on the charts affected. Radio Navigational Warnings of a permanent nature and those relating to derelicts and drifting obstructions dangerous to navigation are re-issued in the form of Admiralty Notices to Mariners, but other warnings are not re-issued in this way, except in special circumstances.

Corrections from information received from authorities other than the Admiralty should be noted, *in pencil*, on the charts affected, but no charted danger is to be expunged without the authority of the Hydrographer of the Navy.

NAVIGATIONAL PUBLICATIONS.

1. **Admiralty Sailing Directions, Supplements, &c.**—The Admiralty Sailing Directions, consisting of about 73 volumes for the whole world, contain general information useful to the navigator.

An index chart bound near the beginning of each volume shows the area dealt with and the serial numbers and limits of all Admiralty charts for the area which were published *when the volume was printed.*

Each volume is periodically revised throughout, and, in the intervals between the publication of new editions, Admiralty Notices to Mariners and Supplements are published to enable the volume to be corrected. It should, however, be clearly understood that Sailing Directions cannot be correct in all minor details after the date of the latest Supplement.

The above-mentioned corrections are not made in the Sailing Directions stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts.

A new edition of each volume of Sailing Directions is published at intervals of approximately from ten to twelve years. The number of the latest Admiralty Notice to Mariners used in its compilation is given in the " Advertisement " on page iii of each volume, and the numbers of the Notices affecting it between the dates of going to press and issue to ships and establishments are given in the Notice announcing its publication, to enable the new edition to be corrected before being brought into use.

A Supplement to each volume is generally published annually, each succeeding Supplement cancelling the former. When a volume is taken up for revision, however, no further Supplement to that edition is issued, but subsequent Notices to Mariners affecting it are summarised each year and issued as a separate publication, until the new edition of the volume is published.

A tabular form for notation of the existence of Supplements and Summaries of Notices is printed on the front fly-leaf of all Sailing

Directions, and these notations are made as necessary in all copies issued by the Hydrographic Supplies Establishment and the Admiralty Chart Depôts.

Supplements and Summaries of Admiralty Notices to Mariners should be retained intact. *Whenever reference is made to the Sailing Directions, the Supplement, and where applicable the Summary, must be consulted.* The existence of a Supplement or Summary of Admiralty Notices to Mariners is to be entered in the tabular form inside the cover of the Sailing Directions. New and amended information appearing in the Supplements for the first time is indicated by square brackets, and deletions from the previous Supplement are indicated by horizontal lines.

Admiralty Notices to Mariners affecting Sailing Directions ***are not*** to be cut up and pasted in, but the book is to be annotated in the margin, or corrected in manuscript, as convenient.

2. The Admiralty List of Lights, Fog Signals and Visual Time Signals.—The Admiralty List of Lights, Fog Signals and Visual Time Signals for the world is issued in twelve volumes divided geographically as shown on the index chart at the beginning of each volume.

Light-buoys are *not* included in the list.

The volumes are published annually at the rate of one volume per month commencing with Volume 1 about March and ending with Volume 12 about February. Supplements to these volumes will not be issued.

Each volume will be issued with an inscription on its cover and title page stating the date to which the volume has been corrected, which will be approximately six weeks prior to the date of its issue. Corrections or additions to each volume, which may occur between the date of correction and date of issue, will be promulgated by Section III of Admiralty Notices to Mariners.

Amendments.—Important amendments are promulgated in Admiralty Notices to Mariners. In Section III of each Weekly Complete Edition of these Notices will be found all additions and alterations made to Lights, Fog Signals and Visual Time Signals by the Notices issued during the week affected; certain other additions and alterations are also included in Section III, which, though not of sufficient importance to necessitate the issue of a Notice to Mariners, will be found of use to the seaman.

Corrections to the Light Lists should be made in pencil, or extracted from Section III and pasted in the appropriate volume.

Note.—Corrections are not made in copies of the Lists of Lights, &c., stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts, and copies received from these sources should accordingly be corrected from the weekly editions of the Notices to Mariners before being brought into use.

3. The Admiralty List of Radio Signals.—The Admiralty List of Radio Signals is issued in three volumes.

Volume I.—Communications—Comprises particulars of radiotelegraph coast stations, together with general regulations; it also includes such subsidiary services as medical advice supplied by radio.

Volume II.—Navigational Aids—Comprises particulars of services from direction-finding stations, radiobeacons, and radio navigational aids (position fixing systems) together with radio time signals and navigational warnings (with ice signals); all relevant codes and regulations will be found in this volume.

Volume III.—Meteorological Services—Comprises particulars of weather services provided for the use of shipping, together with relevant codes and lists of meteorological observation stations.

New editions of each volume will normally be published annually.

All corrections subsequent to the date of publication are promulgated in Section VI of the complete weekly edition of Admiralty Notices to Mariners.

Copies of the List stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts are not kept corrected, and Lists received from these sources should accordingly be corrected from the weekly editions of the Admiralty Notices to Mariners before being brought into use.

4. **The Admiralty Tide Tables.**—The Admiralty Tide Tables are published in three sections as follows :—

For " EUROPEAN WATERS (including Mediterranean Sea)."
For " ATLANTIC AND INDIAN OCEANS."
For " PACIFIC OCEAN AND ADJACENT SEAS."

Each section contains two parts, Part I giving tidal predictions for Standard Ports and tidal stream predictions for certain straits and channels. Part II giving data for predicting tides at places which are not Standard Ports.

Admiralty Tide Tables, Part III, contains instructions for predicting tides and tidal streams, and for analysing observations of tides and tidal streams, with tables to assist prediction and analysis.

THE USE OF CHARTS AS NAVIGATIONAL AIDS AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

(1) **Reliance on a chart.**—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger the scale of the chart.

To estimate this the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

It appears to be insufficiently realised that the degree of reliance which may reasonably be placed upon an Admiralty chart, even in surveys of modern date, is mainly dependent on the scale on which the survey was made. The scale for publication is now generally that of the original survey, except in the case of coast sheets which are sometimes reduced. It should not, therefore, be assumed that the original survey was made on a larger scale than that published.

It must be borne in mind that the principal method of ascertaining the inequality of the bottom of the sea is by the laborious process of sounding, and that in sounding over any area, the boat or vessel obtaining the soundings is kept on given lines; that each time the lead descends, or a sonic sounding is taken, the depth over only a small area is obtained, in the case of the lead, it has a diameter of only a few inches, and that consequently each line of soundings, though miles in length, is only to be considered as representing a narrow width.

Surveys are not made on uniform scales, but each survey is made on a scale commensurate with its apparent importance. For instance, a general survey of a coast which vessels only pass in proceeding from one place to another is not usually made on a scale larger than one inch to the nautical mile, while surveys of areas where vessels are likely to anchor are made on a scale of three inches to the mile, and surveys of frequented ports or harbours likely to be used by fleets, on a scale of from six inches to ten inches to the nautical mile.

Close examination by sounding is the only method by which surveys on a large scale can be made, and in view of the vast mileage of surveys yet requiring completion in the interests of navigation, it would be a waste of time to undertake large-scale coast surveys.

The scale on which a survey is to be conducted having been settled, it is manifestly superfluous to obtain more lines of soundings than can be represented on the paper. 100 soundings, which is the maximum number that can be placed with clearness on every square inch of paper, means that on a scale of one inch to the mile each sounding on the chart occupies an area representing eight acres of actual ground, whilst on a scale of six inches to the mile each sounding represents an area of a little less than a quarter of an acre, i.e., of 100 feet square.

The following diagram represents as many soundings as can be placed legibly on a square inch of paper:—

16	15	15	13	13	14	12	11	10	9
14	15	14	14	13	13	12	11	9	8
15	15	14	17	16	14	13	10	10	9
16	16	17	18	16	12	11	8_3	9	10
18	17	15	12	9	7_3	7_4	7_4	9	10
19	16	12	9	5_3	4_4	5_4	6_4	8_3	9
22	19	16	10	3_4	5_1	6_1	7_3	8_3	10
20	16	12	7_1	5_4	6_1	6_4	7_1	8_3	10
18	15	11	9	7_3	7	7_3	8_3	10	11
20	17	14	11	12	10	9	10	11	13

Little assistance in detecting excrescences on the bottom is afforded by the eye, when sounding in a boat, even in clear water, on account of the observer being within five feet of the surface; none in turbid seas. If, therefore, there is no inequality in the soundings to cause suspicion, a shoal patch between two lines may escape detection.

Thus, in a chart on a scale of one inch to the mile, an inequality of some acres in extent rising close to the surface, if it happened to be situated between two lines, might escape detection; whilst in a chart on a scale of 6 inches, inequalities as large as battleships, if lying parallel with, and between the lines of soundings, might exist without detection if they rose abruptly from an otherwise even bottom.

General coast charts should not, therefore, be looked upon as infallible, and a rocky shore should on no account be approached within the ten-fathom contour line, without taking every precaution to avoid a possible danger; and even with surveys of harbours on a scale of 6 inches to the mile vessels should avoid, if possible, passing over charted inequalities in the ground, as some isolated rocks are so sharp that the lead may not find the highest part. Better results can, however, be obtained by sonic sounding owing to the rapidity with which such soundings can be taken, but even this method will not find rocks unless the boat or vessel be directly over them.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion.

Soundings in hair line, which are shown on the latest charts in upright figures, and on other charts in sloping figures, indicate that such soundings have been taken from smaller scale charts, an unreliable source, or adapted from old and imperfect surveys.

(2) **Fathom lines a caution.**—Except in plans of harbours that have been surveyed in detail, the six-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shore in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, as before mentioned, another warning, especially for ships of deep draught.

Charts on which no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided as there is no knowing how closely the spot may have been examined.

(3) **Chart on largest scale always to be used.**—It sometimes happens that from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or sounding. This is an additional reason, besides the obvious one of the greater detail shown, why this largest scale chart should always be used for navigating.

(4) **Caution in using small-scale charts.**—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile.

For the same reason bearings to near objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

(5) **Graduation.**—All plans are now being graduated in skeleton style before publication in order to facilitate easy reference to astronomical positions; previously published plans are also graduated as opportunity offers. The graduation is, however, of necessity often

based upon imperfect information of a conflicting nature; for this reason, whenever an astronomical position is quoted other than approximate (i.e., when seconds are given), it is necessary to quote also the number of the particular chart from which the position has been derived.

In this connection it is pointed out that, whenever possible, a position should be transferred from one chart to another by bearing and distance from a distinguishing feature common to both, such as a point of land or a light, &c., and not by the graduation which may differ owing to one of the charts being constructed on later and more complete astronomical data than the other.

(6) **Distortion of printed charts.**—The paper on which charts are printed is, from various causes, subject to distortion, but the effect of this is seldom sufficient to affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted upon the chart, especially if the lines are to objects at some distance. The larger the chart the greater the amount of this distortion.

(7) **Buoys.**—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should, therefore, be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings of fixed objects on shore or angles between them, and not by buoys.

(8) **Light-buoys.**—The lights shown by light-buoys cannot be implicitly relied on, as, if occulting or flashing, the apparatus may get out of order, or the light may be altogether extinguished. These lights in the British isles are from 5 to 217 candle-power.

(9) **Cable-buoys.**—Cable-buoys marking the ends of submarine cables usually are spherical or can-shaped, surmounted by a globe and occasionally a flag. Below the topmark two *white fixed* lights, disposed horizontally, may be exhibited, but they cannot be implicitly relied on.

(10) **Lights.**—Arcs drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely to indicate, in the case of lights which do not show the same characteristics or colours in all directions, the bearings between which the differences occur.

All the distances given in the Admiralty List of Lights and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to elevation, at the beginning of each volume of the Admiralty List of Lights, affords a means of ascertaining how much more or less the light is visible should the height of the eye be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its candle power, as given in the Admiralty List of Lights, and in some cases by noting how much its visibility in clear weather falls short of the range due to the elevation at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its elevation would permit it to be seen over 20 miles, if of any power. (*See* table in the Admiralty List of Lights.)

The distance from a light cannot be estimated either by its brilliancy or its dimness.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip it may be determined whether the vessel is in the circle of visibility corresponding with the usual height of the eye or unexpectedly nearer the light.

(11) **Fog signals.**—Sound is conveyed in a very capricious way through the atmosphere. The following points in regard to fog signals should be borne in mind:—

(*a*) Fog signals are heard at greatly varying distances.
(*b*) Under certain conditions of atmosphere, when an air fog signal is a combination of high and low tones one of the notes may be inaudible.
(*c*) There are occasionally areas around a fog signal in which it is wholly inaudible.
(*d*) A fog may exist a short distance from a station and not be observable from it, so that the signal may not be sounded.
(*e*) Some fog signals cannot be started at a moment's notice after signs of fog have been observed.

Mariners are therefore warned that fog signals cannot be implicitly relied upon, and that *the practice of sounding should never be neglected.* Particular attention should be given to placing "Look-out men" in positions in which the noises in the ship are least likely to interfere with the hearing of the sound of an air fog signal; as experience shows that, though such a signal may not be heard from the deck or bridge when the engines are moving, it may be heard when the ship is stopped, or from a quiet position. It may sometimes be heard from aloft though not on deck.

Great assistance may be obtained from radio beacons at many important lighthouses and light-vessels, but the attention of Mariners is called to the serious dangers which may arise from their misuse. No attempt should be made to approach such a position on a radio bearing, whilst relying only on hearing the sound fog signal in sufficient time to alter course to avoid danger. When the radio fog signal is transmitted from a light-vessel, it is essential in order to avoid collision, that the bearing from the light-vessel should not be kept constant.

(12) **Tides.**—In navigating coastal waters where the range of the tide is considerable, caution is always necessary. The tidal predictions for Standard ports in the Admiralty Tide Tables can generally be relied upon to give the times of high and low water to within a few minutes, and heights within a few tenths of a foot. Larger errors are to be expected in the predictions for places which are not Standard ports, computed from the data in Part II, but such predictions computed from the harmonic constants are always sufficiently accurate for the general requirements of navigation. For Standard ports the heights of the tide at times between high and low water may usually be found within narrow limits in accordance with the instructions in Parts I and III of the Tide Tables.

The datums of Admiralty charts depending on Admiralty surveys vary with the type of tide, but usually conform with the International agreement, that datum should be " a plane so low that the tide will but seldom fall below it." The datums used by different nations, however, differ very considerably and those of Admiralty charts depending on foreign surveys are always those used by the original surveyors, which vary from " lowest possible low water " to " mean low water " in tidal waters, and are usually mean sea level in non-tidal waters.

The datum used is always stated on large-scale Admiralty charts.

Caution.—Most datums are above the lowest level to which the tide may fall; the charts therefore do not always show minimum depths.

(13) **Tidal streams.**—Where the tidal streams are semi-diurnal information regarding them is usually given, in a convenient part of the chart, in tabular form or by notes, special symbols being inserted at the positions to which the information refers. In certain cases, where the information available is incomplete, the streams are indicated by means of arrows.

There are many places where the tidal streams cannot be predicted by reference to the tide at a Standard port. Although no data for predicting the times at which they flow is given, their general direction is, in many cases, indicated by arrows on the charts. For a few of the straits and channels, where these conditions exist, tidal stream predictions are given in Admiralty Tide Tables.

Tidal streams, particularly if rotary, may vary considerably both in direction and rate; predictions of the stream must therefore always be considered approximate.

The turn of the tidal stream is not usually coincident with the times of high and low water; in fact, though in estuaries, harbour entrances, &c., the stream usually turns at about the times of high and low water, in open channels, and along open coasts generally, the turn usually occurs more nearly at half-tide. Predictions of the times of high and low water must therefore never be used as predictions of the times of slack water.

It should be remembered that, even where the general direction of the stream is parallel with the shore, an indraught is usually experienced when crossing the entrances to bays and inlets.

(14) **Fixing positions.**—For further information on this subject, *see* Admiralty Manual of Navigation.

When in sight of land, every opportunity should be taken of fixing the ship's position by terrestrial objects.

(*a*) *Simultaneous bearings or angles.*—The most usual method is by compass bearings of suitable objects, and it must be borne in mind that a fix by only two bearings is liable to error, either an absolute error in taking the bearings, or those made in applying the deviation or in laying the bearings off on the chart. For these reasons, a third or check bearing of some other object should, when possible, be taken, especially when near the shore or dangers. The coincidence of the resulting three lines will prevent any mistakes if the objects are suitably placed.

The position may also be fixed by observing horizontal sextant angles of well-defined suitably placed objects. These angles may be plotted on the chart with a station-pointer. Two conditions are, however, necessary to its successful employment; first, that the objects be well chosen; and, second, that the observer is skilful and rapid in his use of the sextant and station-pointer. For the former, reference can be made to the pamphlet on the use of the station-pointer, or to the Admiralty Manual of Navigation; the latter is only to be obtained by practice.

It will readily be seen that a sextant often offers advantages, as angles can be obtained from any position whence the objects are visible, and the fix is in no way dependent on the compass.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

In all cases where great accuracy of position is required, such as the fixing of a rock or shoal, or the addition to a chart of fresh soundings or new buildings, angles should invariably be used. In such cases angles should be taken of a number of objects, five being a good number, since this not only fixes the position beyond doubt, but also affords a useful check on the accuracy of the chart itself. When running a line of soundings it is only necessary to take a third angle every now and then, firstly to make certain that the more important soundings, as at the end of a line, are correctly placed, and secondly to check the general accuracy of the chart.

Sometimes when only one of the selected objects is visible from the compass, a compass bearing of it and a sextant angle to the other may be used to fix the position.

(*b*) *Simultaneous bearing and distance.*—Attention is also directed to the very useful and handy method of fixing by the bearing and distance of a suitable object.

Should the ship be supplied with ranging equipment, its use here is obvious, but without it a very good approximate distance of an object of known height may be obtained by observing its angle of elevation and obtaining its distance from Lecky's Offshore Distance Tables, which are supplied with all sets of charts. Full directions for the use of these Tables are given with them.

(*c*) *The running fix.*—If two position lines are obtained at different times the position of the ship may be found by transferring the first position line up to the time of taking the bearing for the second position line. The point of intersection of the second and the transferred position line is the ship's position at the time of the second observation.

The accuracy of this fix will depend on the accuracy of the estimated run (over the ground) between bearings and, therefore, it is essential to take great care that an accurate allowance is made for tidal stream, current, and leeway experienced by the ship during this interval.

The method of fixing by doubling the angle on the bow is useful when passing points of land, &c., in waters where there is either no tidal stream or current, or where this can be estimated with sufficient accuracy.

This method is as follows:—

Suppose that the angle between the ship's head and an object is measured, and found to be X°, and that the time of the observation is noted. Suppose also that the time is again taken when the angle between the ship's head and the object is 2X°. Then, if the course made good is the course steered, the distance of the ship from the object at the time the second bearing was taken is equal to the run (over the ground) in the interval. Hence the ship's position can at once be laid off as a bearing and distance from the object. In practice the angle X should not be less than about 25°.

The most usual form of this method, the so-called "four-point" bearing, gives a good fix for a departure, but does not ensure safety, as the point and any dangers that may lie off are abeam before the position is obtained.

The above fix is reliable when there is no tidal stream or current or when it runs directly with or against the course of the ship. When the stream or current runs across the course of the ship or when leeway is to be allowed for, this method should never be used and the ship's position should be obtained by plotting the two bearings as a running fix.

A table " Distance of an object by two bearings " is supplied with certain chart folios, and is also given in Inman's Tables, by which the ship's position at the second bearing can be found: any two bearings at a suitable angle to each other may be used, together with the run between them, but, again, this table should not be used when the vessel is subject to a cross tidal stream or leeway.

(*d*) *The danger angle.*—The use of the danger angle in passing outlying dangers with land behind them should also not be forgotten.

A vertical danger angle is useful when the danger lies off an object such as a lighthouse, the height of which is known; the angle being obtained from the aforesaid Lecky's Tables. If a horizontal danger angle between two objects is used, however, caution is necessary, as, should the objects not be correctly placed on the chart, the angle taken from it may not serve the purpose. This method should not, therefore, be employed when the survey is old or manifestly imperfect.

(*e*) *The astronomical position line.*—When fixing by astronomical observations, attention is drawn to the great utility of the position line. Even a single position line may at times give invaluable information, as the ship must be somewhere on this line, provided that the chronometer error is accurately known.

A sounding obtained at the same time may often serve to give an approximate position. Again, by steering along, or at a required distance parallel to, a single position line, a vessel may make her port or avoid a danger, although uncertain of her position.

A very accurate position may be obtained by observations of three or more stars at evening or morning twilight, or by the observation of a bright star at daybreak and another shortly afterwards of the sun when a few degrees (not less than 10°) above the horizon. The position lines obtained from the bodies observed should differ in azimuth by 30° or more.

Mariners are also reminded that, with modern tables for correcting the altitude, observations of the moon entail practically no more calculation than those of a planet. Moon sights are sometimes available when stars are obscured by light cloud, &c.; also, an excellent position may frequently be obtained by simultaneous observations of the sun and moon.

(*f*) *The radio position line.*—A number of radio systems of which the principal ones are M/F D/F, Radio Beacons, Consol Beacons, Loran, Gee and Decca, are now in general use from which position lines or fixes may be obtained.

The accuracy and range which may be obtained from these systems vary considerably; their great advantage over other methods lies in the fact that they can be employed under all weather and visibility conditions, though in some cases the results obtained will vary between day and night.

Special receiving equipment is generally required in order to make use of the radio signal, and some systems require special lattice charts or tables for plotting the position lines. Full details of these systems and their coverage areas are contained in Admiralty List of Radio Signals, Volume II.

The mariner should appreciate that with the position-fixing systems the accuracy of a fix will depend on three factors:—

(i) The distance of the observer from the transmitters.
(ii) The bearing of the observer from the base line joining the pair of stations which he is using.
(iii) The angle of intersection of the hyperbolic position lines.

It should be apparent from the inspection of any lattice chart that an inherent small equipment error, or a small personal error that may occur at the receiver, will cause a geographical error of varying amount according to the observer's position.

It is important to realise that accurate equipment is no guard against the vagaries of the propagation of radio waves. The beacons and systems operating on medium and low frequencies are liable to " night error " in areas where the ground and sky waves are received with equal strength; these areas will occur at ranges depending upon the particular frequency used by any beacon or system. Where the transmissions of two stations are synchronised to provide one signal reading and position line, " night error " will be a minimum along the normal to the base line joining the pair of stations, and a maximum towards the limits of their service sector.

Little is yet known about the effects of hills and discontinuities in the terrain (such as cliffs) on the speed of medium- and low-frequency radio waves.

At the other end of the radio spectrum the transmissions of systems operating on the very high frequencies are subject to distortion in abnormal atmospheric conditions.

(g) *Fixing by radar*.—Radar may also be of considerable assistance when navigating in coastal waters in low visibility or at night. It is essential, however, to appreciate the limitations of a radar set when interpreting the information obtained from it. It must be remembered that the radar horizon is only slightly farther than the visual horizon would be, in good visibility, for a height of eye equal to the height of the radar aerial. Hence no echoes will be received from a coastline lying below the radar horizon, while echoes may be received from high ground farther inland which will give a misleading impression of the range of the nearest land.

Depending on the width of its beam, the bearings from a radar set tend to be inaccurate. It is therefore preferable when fixing by radar to use ranges rather than bearings. It is then most important to consider carefully the identity of the object giving the echo, using the bearing as an indication, and the height of the object to determine whether it will appear on the radar presentation. Radar Range Nomograms are useful in deciding this, but a satisfactory result can be obtained by using " Distance to Sea Horizon Tables."

When two or more objects on the radar presentation have been selected and positively identified, a satisfactory fix can be obtained by striking arcs on the chart with the radar range of the selected objects. These arcs intercept at the ship's position. Best results will be obtained by using isolated objects such as detached lighthouses, rocky islets, and the extremities of long piers or jetties, but where no such objects are available a steep coastline with cliffs should be used. Flat or gently shelving coastlines, such as mud flats or sand dunes, should not be used since it is difficult to identify any portion of them on the radar presentation. Identification is assisted in some areas by fitting objects, such as buoys and beacons, with radar reflectors, causing them to return strong echoes. Attention is drawn to the symbols with which such objects are marked on Admiralty Charts, and which are given in the latest edition of Chart No. 5011, " Explanation of signs and abbreviations used on Admiralty Charts."

The difficulty of positive identification of objects is largely reduced if a Chart Comparison Unit is used in conjunction with the navigational radar. Fixes obtained with this equipment employ, in principle, an infinite number of ranges of the terrain in the vicinity of the ship, and in so doing a satisfactory fix will normally be assured.

In addition, radar beacons are available in some areas. Details of these and their use are given in the Admiralty List of Radio Signals, Volume II.

(15) **Observations for errors of the compass.**—No opportunity should be neglected for checking the error of the compass. When coasting, and a well-surveyed and fairly large-scale chart is available, an excellent method of observing the error is by taking the compass bearing of two suitable objects when in transit, and comparing this with the charted bearing ; there should be sufficient distance between the objects to provide a sensitive transit. When this method is not available the error should be obtained by azimuths of a heavenly body. Errors should be observed on any change of course on which the ship is steadied for a reasonable time, and at least twice a day when steering a steady course for long periods.

(16) **Change of variation of the compass.**—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a degree, but the chart plates cannot be corrected more frequently from the impossibility of making alterations often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles, and in the English channel about 5° in 400 miles. The Variation chart should be consulted on this head.

On certain general charts embracing large areas with considerable change of variation, true compasses are placed instead of magnetic compasses, the variation being shown by *isogonic lines* (curves of equal magnetic variation), in a similar manner to the Variation chart. One or two *isogonic lines* are also sometimes placed on charts, in addition to the magnetic compasses, in order to indicate the general direction of these curves, and thus facilitate the determination of the variation to be employed in portions of the chart not in immediate proximity to any one of the engraved compasses. Magnetic variation values shown on Admiralty charts are for the 1st July of the year mentioned.

(17) **Local magnetic disturbance of the compass on board ship.**—The term " local magnetic disturbance " has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that such disturbance of the

compass in a ship afloat is experienced only in a few places on the globe. Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such a rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic ores in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together. Such areas are depicted by a special symbol on charts, and the cause of the magnetic disturbance is referred to as a Local Magnetic Anomaly.

They may also be due to wrecks lying on the bottom in moderate depths, but investigations have proved that, while deflections of unpredictable amount may be expected when very close to such wrecks, it is unlikely that deflections in excess of 7° will be experienced, nor should the disturbance be felt beyond a distance of 250 yards.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

(18) Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, i.e., waves in deep water, the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

At anchor, when the sea is sufficient to render it difficult to hoist up or in boats, oil bags from forward or from the swinging booms have been found to render the sea alongside comparatively smooth.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances.

Running before the wind they should be hung on either bow and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the depth of the water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

12. Towing a vessel in a heavy sea, oil is of the greatest service, and may prevent parting the hawser. Distribute from the towing vessel forward and on both sides; if used only aft the tow alone gets the benefit.

(19) **Mirage and abnormal refraction.**—An unusual lapse rate of temperature (and therefore density as well) with height immediately above the sea (or land) surface produces a distortion in the appearance of objects near the horizon; such a phenomenon is known as mirage.

When the surface is relatively cold (and the wind very light) so that the density of the air decreases rapidly for a short distance above the surface, light rays from objects low down near the horizon are bent down, the same way in fact as are usually the rays of the sun when entering the earth's atmosphere at a low altitude. The effect is to render visible objects that are normally below the horizon, e.g., lights may be " raised " at night at much greater distances than one would ordinarily expect. This phenomenon is known as " looming."

A further occasional effect produced when the air is appreciably warmer than the sea, is " superior mirage " in which an inverted image is seen over the real object; sometimes an erect image is seen immediately above and touching the inverted one. The object and its images in this instance are well defined in contrast to the shimmering object and image of the inferior mirage. Superior mirage is most often experienced in high latitudes and wherever the sea surface temperature is abnormally low.

" Inferior mirage," the effect of which is to decrease the distance at which objects are visible in a horizontal direction, is due to a rapid increase of density with height close to the surface such as occurs when air of comparatively low temperature blows over a warmer sea, or over a tarred road or desert when a hot sun is beating down on it. In either event light rays are bent up when approaching the surface where the density of the air is much less than above. The coastline, and at times a ship or island, may appear to be floating in air above a shimmering horizon, possibly with, in the former instance, her hull either invisible or with an inverted image underneath. Inferior mirage is comparatively uncommon at sea and is more likely to be observed along a coastline than well out to sea.

When mirage is evident caution must be used in taking sights with a sextant, for abnormal refraction must necessarily be present also. With inferior mirage better, but not normal, results will usually be obtained by ascending as high as possible in the ship; with superior mirage the height of eye should be as low as possible. It is, however, advisable, whenever abnormal refraction is suspected, to measure the elevation of the celestial body above the back as well as the front horizon as explained in navigational text-books.

(20) **Aurora.**—The most common form of aurora is an arc system, single or multiple, narrow and well defined, or broad and diffuse, and centred on the magnetic meridian.

The most usual colour is pale whitish green when the auroral activity is weak and diffuse: but when the aurora arises high towards the zenith in the form of rays, rayed curtains and draperies with much rapid movement of the constituent rays, the colours sometimes become much stronger and more vivid, and include bright green, red and violet. When the curtains forming the aurora converge to form a corona, which may rotate very rapidly about the point of convergence, the displays may become very complex, filling practically the whole sky, and extending far to the equatorial side of the zenith with much rapid movement and change of colour from instant to instant.

Though the most usual duration of auroral displays in these high latitudes is several hours, they not infrequently last throughout the whole night from dusk to dawn. In such long displays the really intense and violently active periods with vivid strong colours are generally confined to spasms of 15–30 minutes, with the intervening periods filled with diffuse glows or quiet arc systems.

The absolute intensity of the light of the aurora is seldom great, and the brighter stars usually glimmer through it. In the most vivid and intense displays, the light may equal, but rarely surpasses, that of the full moon in a cloudless sky. It may give enough light to read by. On such occasions the aurora may be visible to some extent in partial twilight.

Though in high latitudes aurora occurs any time in the dark hours it is probably most frequent in the late evening hours from 9 p.m. till midnight or just after; it is more frequent in the equinoctial months than at other times and has a well-defined 11-year period of activity following the cycle of solar activity. A maximum of activity occurred in 1948, and the interval from maximum to minimum activity usually occupies a period of about 6 to 7 years. In high latitudes this cycle of activity is reflected more in the intensity and vividness of the displays than in their frequency of occurrence. Though really outstanding displays tend to occur around the years of maximum activity they may occur at any time of the cycle, except perhaps near the absolute minimum.

In addition to this 11-year cycle of activity active periods tend to recur at intervals of 27 days, *see* Magnetic Storms.

Northern hemisphere.—Aurora Borealis occurs most frequently along a zone which forms an approximate oval, of average radius 23°, with centre in the extreme north-west of Greenland. This zone of maximum frequency crosses Hudson Bay and the Labrador coast in about lat. 58° N. It runs south of Cape Farewell and along the south coast of Iceland. It lies just north of North Cape, touches the extreme north of Novaya Zemlya, skirts Cape Chelyuskin and then eastward just north of Wrangel Island into the north of Alaska. Along this zone aurora of some kind can probably be seen every suitable night when the sky is clear; 250 miles outside this maximum zone to the southward the auroral frequency decreases sharply to about 70–100 nights a year on the average, and to 20–25 nights 500 miles south of the maximum zone. Inside the maximum zone the geographical distribution of frequency is not so well established but it probably falls off more gradually than it does outside.

On the zone of maximum frequency itself aurora appears as frequently to the south of the zenith as to the north, but with increasing distance outside the zone the appearances concentrate more into the northern sky; the reverse is true inside the zone.

Southern hemisphere.—The frequency and distribution of Aurora Australis is not fully known. It is probable that it is more frequently seen at sea between about long. 50° E. and 175° W. than in other longitudes. Very fine displays have occasionally been seen in Australasia and on passages across the Southern Ocean. There is nevertheless a general impression that aurora is less frequent in the southern than in the northern hemisphere. This is probably to be accounted for by the fact that, apart from whaling and exploring expeditions, ships' tracks in general do not extend to such high latitudes as in the northern hemisphere.

The zone of maximum auroral frequency is roughly annular and is near the circumference of a circle of radius about 1,080 miles, centred in about lat. 75° S., long. 129° E. The frequency falls off both outside and inside this zone. A large part of the zone is within the continent of Antarctica.

(21) Magnetic storms.—Magnetic storms vary in intensity and frequency with the sunspot cycle, similarly to aurorae. An intense magnetic storm is always accompanied by a bright and active aurora. The deeply coloured aurorae, showing more pronounced red and green, and sometimes also blue and violet, tints, are invariably connected with magnetic storms of considerable or great intensity. Such a storm will produce simultaneous aurora in both hemispheres. In the greatest storms aurorae in some form may be visible down to about 20° north latitude in certain parts of the oceans, especially between the meridians of 30° W. and 140° W. Magnetic storms vary greatly in duration from a few minutes to several days; they are generally more intense during the hours of darkness. Long-continued storms usually show great fluctuations with periods of complete or partial quiescence. Similarly the associated aurora fluctuates between active and quiescent forms.

The origin of magnetic storms and aurorae is not yet fully understood, but they are intimately connected with the state of a local area of the sun. As the same part of the sun is again presented to the earth after an interval of about 27 days, a magnetic storm and aurora may recur at this time, usually in less intense form.

A ship's compass may tend to deviate during the progress of a considerable magnetic storm. In more intense storms the compass needle may oscillate 1° or more either side of its normal position. Such oscillation may persist for as long as 10 or 20 minutes before dying out. Further oscillation may occur after a period of quiescence. Deviations of 2° or more are rare, but during the great magnetic storm and aurora of January 25th, 1938, one of 4° to the eastward was observed off the Portuguese coast. During a severe magnetic storm the compass may be deflected continually in one direction to the extent of about half a degree for some hours. When bright aurora is seen, especially if it is of the more deeply coloured and rapidly moving kind, and particularly when it is observed in low latitudes, the possibility of deflections of the compass should always be borne in mind.

During a considerable magnetic storm freak wireless reception may occur on certain waves and short-wave transmission may fade to complete silence. Beam radio communication, especially in a west-east or east-west direction, may be interrupted. Such conditions may last in some degree over a period of several days, at times when the sun is unusually active. Short-wave fading also occurs occasionally from a different form of solar disturbance known as a " bright eruption," when this is very intense. On the average such fading begins about 7 minutes after occurrence of the bright eruption and may last 5 or 10 minutes, gradually returning to normal within a period of 40 to 45 minutes. These fadings are confined to the daylight hemisphere of the earth, while the magnetic storm fadings may occur by day or by night.

GENERAL METEOROLOGY.

(All the following articles do not apply to every Pilot, but articles applicable to this Pilot will be referred to in the Climate and Weather Section in Chapter I.)

(1) **Lows.**—A low, or depression, appears on a synoptic chart as a series of isobars roughly circular or oval in shape, surrounding an area of low pressure. It is a main feature of the weather at sea in middle latitudes where it is responsible for most of the occasions of strong winds and unsettled weather, though not all depressions are accompanied by strong winds.

Lows vary very much in size and depth; one may be only a hundred miles in diameter and another over two thousand miles; some are deeper than others, a deep low being one in which the pressure is very much lower near the centre than on the outside whereas, on the other hand, a shallow depression is one where the pressure, although low near the centre, is not very much lower than in the surrounding districts.

Note.—The bracketed equivalents hereunder refer to the Southern Hemisphere.

In the northern (southern) hemisphere the winds blow round an area of low pressure in an anti-clockwise (clockwise) direction; there is also a slight inclination across the isobars towards the lower pressure. Thus the well-known rule for the northern (southern) hemisphere is that when an observer faces the wind the direction of the lowest pressure is from 8 to 12 points to his right (left). The strength of the wind is in all instances closely related to the steepness of the barometric gradient or distance apart of the isobars; the closer the isobars the stronger the wind.

Lows may move in almost any direction, though most often towards north-east (south-east) or east, at a speed of anything between 10 and 40 knots, though occasionally as much as 60, during the middle and most active stage of their existence; they slow down when filling up (*see* " occlusion " below). The life of a low is in the region of 4 to 6 days, There are usually one or more fronts, probably radiating from the centre, in the area covered by a low; each front on a synoptic chart represents a belt of relatively bad weather, accompanied by a veer (backing) of wind, which marks the change from the weather characteristic of one air mass to that of another. During the first two or three days of its life a low has a warm and a cold front, the area between the two being known as a warm sector because the air has come from a warmer locality than that which is outside the sector (*see* Fig. 1*a*). Warm air is lighter than cold air and it rises over the cold air ahead of the warm front as shown in Fig. 1*b*; this causes condensation of the water vapour in the warm air, forming at first cloud and later drizzle or continuous steady rain. The cloud spreads out ahead of the warm front, and the highest cloud, cirrus or mares' tails, is often about 500 miles ahead. At the rear boundary of the warm sector, known as the " cold front," the cold air is pushing under the warm air forcing the latter to ascend rapidly; this process is sometimes violent enough to produce squalls. The rapid ascent of the warm air causes the moisture to condense in the form of cumulo-nimbus clouds (shower clouds), from which heavy showers may fall. The cold front gradually overtakes the warm front so that the warm sector is eventually lifted up from the earth's surface. When this has occurred the low is said to be occluded, and the warm and cold fronts have merged into the third type of front known as an " occlusion " (*see* Figs. 2*a* and *b*). When a low has become occluded, it usually decreases in intensity and rate of travel, and gradually fills up. On the other hand, a low which has a marked warm sector is likely to be deepening, the winds associated with it may increase in force and its rate of travel may increase. Lows are usually travelling in a direction approximately parallel to the isobars (and in the direction of the wind) in the warm sector.

The approach of a low is indicated by a falling barometer. In the northern (southern) hemisphere, if the low is approaching from westward and passing northward (southward) of the ship, clouds appear on the western horizon, the wind shifts to a south-westerly (north-westerly) or southerly (northerly) direction and freshens, the cloud layer gradually lowers, and finally drizzle, rain or snow begins. If the low is not occluded, after a period of continuous rain or snow there is a veer (backing) of wind at the warm front, a rise of temperature and diminution or cessation of rain (or snow) in the warm sector, the visibility being usually moderate and the sky overcast with low cloud. The passage of the cold front is marked by the approach from westward of a thick bank of cloud (which however cannot often be seen because of the customary low overcast sky in the warm sector), a further veer (backing) of wind to west or north-west (south-west), sometimes with a sudden squall, rising pressure, a fall of temperature, squally showers of rain, hail or snow, and improved visibility (except during showers). The squally showery weather with a further veer (backing) of wind and drop in temperature may recur while the low recedes owing to the passage of another cold front or occlusion. If the low is occluded, the occlusion is preceded by the cloud of the warm front; there may be a period of continuous rain mainly in front of and at the line of occlusion, or a shorter period of heavy rain mainly behind the occlusion, according as the air in front of the occlusion is colder or warmer than that behind it. There may be a sudden veer (backing) of wind at the occlusion.

Often another low follows 12 to 24 hours later, in which event the barometer begins to fall again and the wind backs towards south-west (north-west), or even south (north).

If a low travelling eastward or north-eastward (south-eastward) is passing southward (northward) of the ship, the winds in front of it are easterly and they back (veer) through north-east (south-east) to north (south) or north-west (south-west); changes of direction are not likely to be so sudden as on the southern (northern) side of the low. In the rain area there is often a long period of continuous rain and unpleasant thick weather with low cloud. In winter in the colder regions the weather is cold and raw and precipitation is often in the form of snow.

Near the region of lowest pressure, lulls are sometimes experienced, but sudden changes are likely, and in a deep low the wind may increase in strength very rapidly, perhaps to gale force as the barometer begins to rise.

Sometimes in the air circulation of a large low, usually on the equatorial side and often on a cold front, a secondary depression develops, travelling in the same direction as the primary but usually more rapidly. The secondary often deepens while the original low decreases in intensity. In the region between the primary and the secondary depressions, the winds are not as a rule strong; but on the further side of the secondary, usually the southern (northern) side, winds are likely to be strong and they may reach gale force. Thus the development of a secondary may cause gales at a greater distance from the primary than anticipated, while there may be only light winds where gales were expected.

The above is a brief general description of lows and the associated weather in temperate or middle latitudes of the northern (southern) hemisphere. It must be emphasised, however, that individual lows in different localities differ considerably from one another, according to the characteristics (especially the temperature and humidity) of the air currents of which they are composed, and the nature of the surface over which they are travelling.

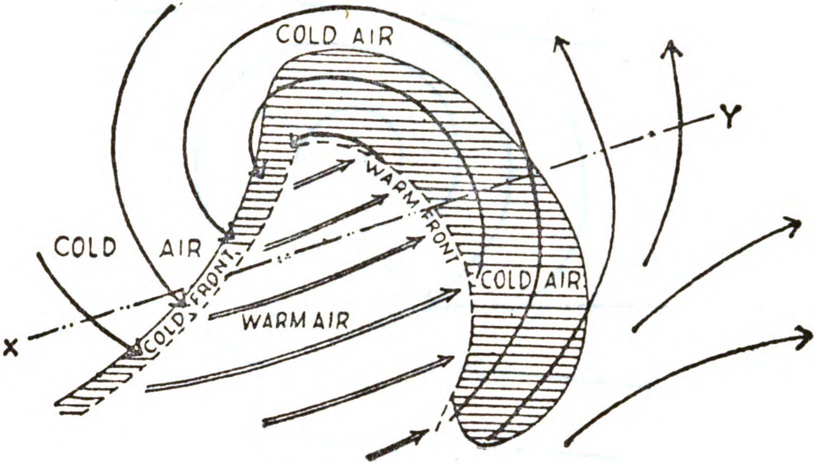
(2) **Tropical revolving storms.**—*Practical rules for avoiding them.*—These storms are so named because the wind blows round an area in which the lowest pressure is at the centre. The direction of rotation is anti-clockwise in the northern hemisphere and clockwise in the southern hemisphere. The wind does not revolve round the centre of low pressure in concentric circles but has a spiral movement inwards, towards the centre of the storm field.

A tropical storm is not so extensive as the depression of higher latitudes but, within 75 miles or so of the centre, the wind is often far more violent, and the high and confused seas near the centre may cause considerable damage to large and well-found ships, while small vessels (for example, destroyers) have foundered. The danger is still greater when ships are caught in restricted waters without adequate room to manœuvre. Within 5 to 10 miles of the centre the wind is light or moderate and variable, the sky is clear or partially so, and there is a heavy, sometimes mountainous, confused swell; this area is known as the "eye" of the storm. After passing through the relatively windless centre of the storm the wind will suddenly, and with great violence, commence to blow from a direction almost opposite to that experienced on the other side of the windless centre. Due to torrential rain and sheets of almost continuous spray, visibility near the storm centre (but outside the "eye") is almost nil.

Every ship navigating in an area subject to tropical storms during

NORTHERN HEMISPHERE.

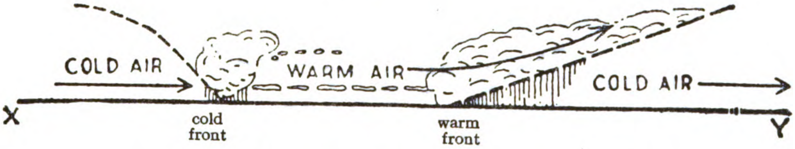
Fig. 1a.



Plan of a developed depression.

The double lines show the flow of the warm air, and the single lines the flow of the cold air.
The shading shows the areas where rain (or snow) is most probable.
Width of rain belt ahead of warm front is generally between 100 and 200 miles.

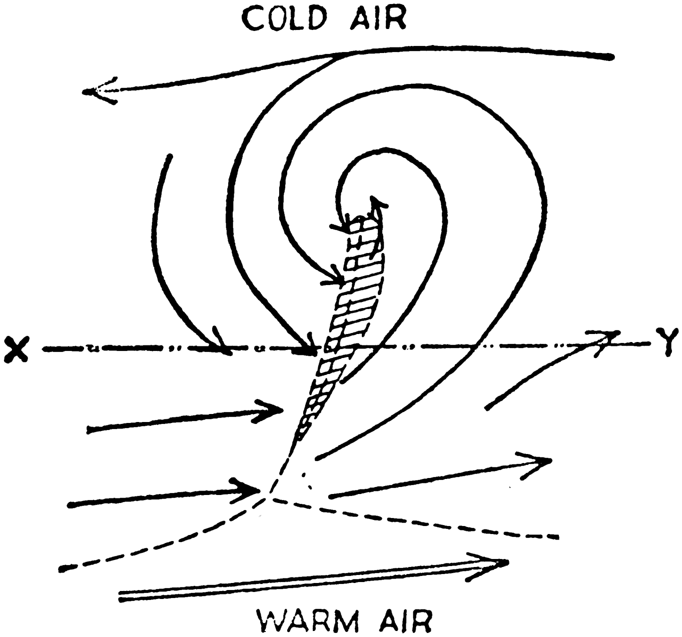
Fig. 1b.



Vertical section of the depression along the line XY.

[*See over page.*

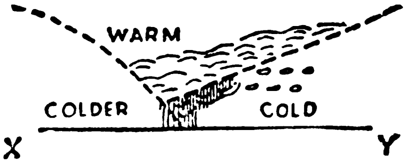
Fig. 2a.



Plan of an occluded depression.

The shading shows the region where rain (or snow) may be expected near the occlusion.

Fig. 2b.

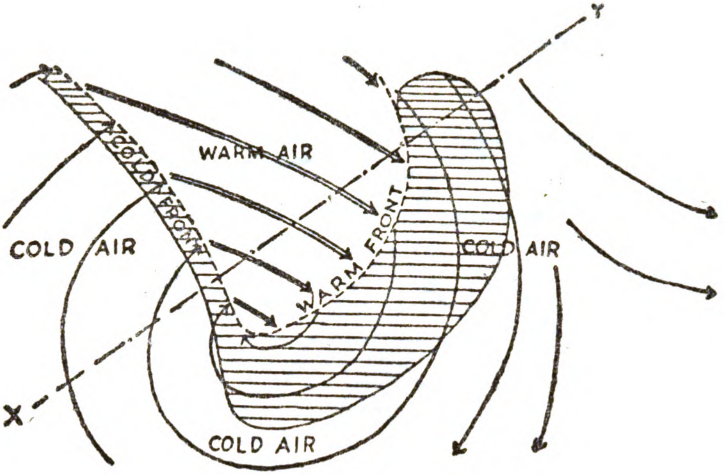


Vertical section of an occlusion of the cold front type.

The air in front of the occlusion is warmer than the air behind it.

SOUTHERN HEMISPHERE.

Fig. 1a.



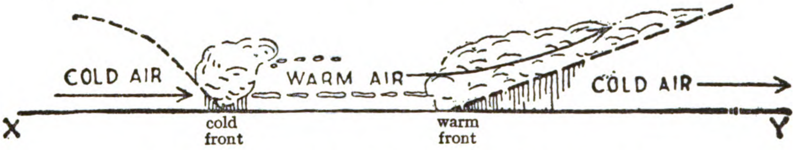
Plan of a developed depression.

The double lines show the flow of the warm air, and the single lines the flow of the cold air.

The shading shows the area where rain (or snow) is most probable.

Width of rain belt ahead of warm front is generally between 100 and 200 miles.

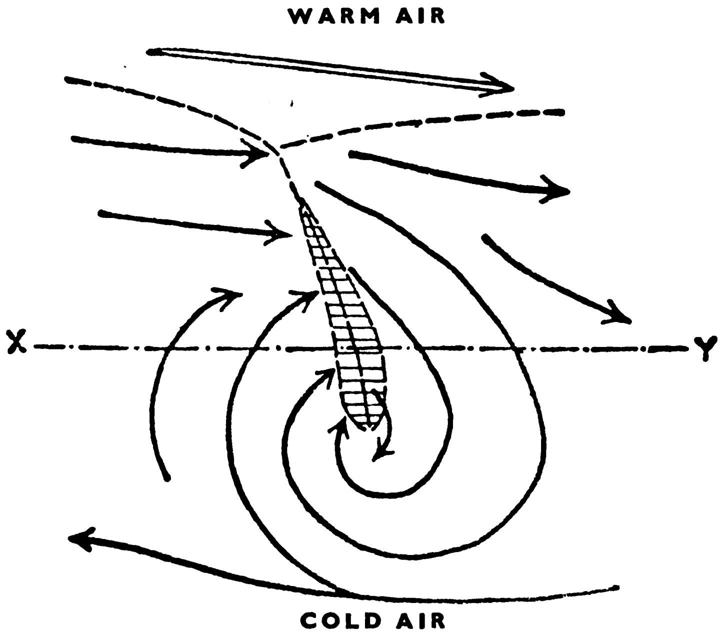
Fig. 1b.



Vertical section of the depression along the line XY.

[*See over page.*

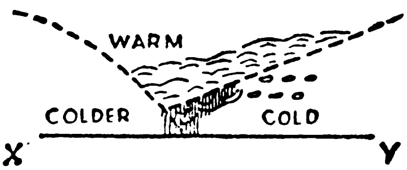
Fig. 2a.



Plan of an occluded depression.

The shading shows where rain (or snow) may be expected near the occlusion.

Fig. 2b.



Vertical section of an occlusion of the cold front type.

The air in front of the occlusion is warmer than the air behind it.

the season of their occurrence should be constantly on the alert for any sign of their approach, so that steps can be taken to avoid the danger zone while there is still time and sea-room.

Localities, season, and average frequency.—Tropical storms occur for the most part on the western side of the oceans, though they are also experienced in the Bay of Bengal, off the north-west coast of Australia, and off the west coast of Central America. They are unknown in the South Atlantic. They are given various names according to the part of the World in which they occur.

Western North Atlantic	–hurricanes
Eastern North Pacific	
South Pacific	
Western North Pacific	–typhoons
Indian Ocean	–cyclones
Bay of Bengal	
Arabian Sea	
North-west Australia	–willy-willies

They are most frequent during the late summer and early autumn of their hemisphere; they are comparatively rare in the southern hemisphere from mid-May to November, and in the northern hemisphere from mid-November to mid-June. In the Arabian Sea, however, storms are most likely to occur at the change of the monsoon, i.e., October–November, and May–June, though they average only one or two a year. Out-of-season storms occur from time to time, particularly in the western North Pacific where no month is entirely safe, and in the Indian Ocean where one is reported south of the Equator perhaps once in two years outside the usual season. The following table shows approximately the average number of severe tropical storms recorded per annum, from statistics taken over several years for the various areas:—

West Indies	5
Western North Pacific	25
„ South Pacific	3
Southern Indian Ocean	6
Bay of Bengal	2
Arabian Sea	1
Eastern North Pacific	3
West Coast of Australia	1

Variations in any one year amounting to 50% above or below the average are not unusual. Some of the figures quoted are probably an underestimate since in the less-frequented parts of the world many storms must escape detection.

Origin, movement and extent.—Tropical storms originate as a general rule in the doldrums, between the parallels of 7° and 15° of latitude; those which affect the western part of the Pacific, South Indian and North Atlantic Oceans are first reported in the western third of those oceans, though there are exceptions such as in the North Atlantic during August and September where an occasional storm is known to begin near the Cape Verde islands. In the northern hemisphere they move off in a direction between 275° and 350°, though most often within 30° of due west. When in a latitude of 25° or so they usually recurve away from the equator and, by the time they have reached the 30th parallel, the track (or path as it is more usually called) is north-easterly. In the southern hemisphere they move off in a WSW.

to SSW. direction (usually the former), recurve at about 15° to 20° S., and thereafter adopt a south-easterly path. In either hemisphere many storms do not recurve but continue in a west-north-westerly (or west-south-westerly) direction until they reach the mainland where they quickly die.

The speed of advance of these storms is usually about 10 knots in their early stages, increasing a little with latitude; it seldom exceeds 15 knots before recurving, but after recurving 20 to 25 knots is usual though speeds of 40 knots or even more have been known.

Occasionally storms move erratically, the path turning towards the equator, or adopting an easterly component in a low latitude, or even making a complete loop, but on these occasions their speed of advance is low, usually less than 10 knots, while the unusual path is being followed.

The extent of the storm area varies considerably with individual storms but, generally speaking, winds of force 7 or more are improbable at more than 200 miles (especially on the equatorial side of the storm area) and force 8 is unlikely to be exceeded at more than 100 miles, from the storm centre, if in a latitude of less than 20°. Thereafter the radius increases with latitude so that these distances are nearly doubled on reaching the 35th parallel, but the intensity diminishes near the centre. Hurricane force winds are likely within 75 miles of the storm centre in the tropics, and gusts exceeding 150 knots have been reported in a few instances within 50 miles or so (except in the eye of the storm). The aim of the mariner should therefore be to remain as far as possible from the centre of the storm system.

Warning of existence or approach.—In most instances, warning of the position, intensity and probable movement of a storm is given by radio at frequent intervals by meteorological authorities ashore. (*See* Admiralty List of Radio Signals, Volume III.) Sometimes, however, there is insufficient evidence available for an accurate warning or even a general warning to be given and ships must then be guided by their own observations. Of the following indications of the proximity of a tropical storm, the first is by far the most reliable within 20° or so of the equator; it should be borne in mind, however, that very little warning may be expected of the approach of an intense storm of unusually small diameter.

(*a*) If the corrected barometer reading is 3 mb. or more below the mean for the time of year, as shown in a climatic atlas or on the appropriate chartlets in the meteorological text of this Pilot, suspicion should be aroused and action taken to meet any development, such as raising steam in any available additional boilers, &c. It should be noted, however, that the barometer reading must be corrected not only for height, latitude, temperature and index error (if mercurial), or for height and index error if aneroid, but also for diurnal variation, the amount of which is given for each hour of the day in the Air Ministry climatic atlases and in the meteorological text of this Pilot. If the reading thus corrected is 5 mb. or more below normal, it is time to take avoiding action for there can be little doubt that a tropical storm is in the vicinity. According to an analysis of observations in the Western Pacific the centre of the storm is then probably not more than 200 miles away. At this distance, at any rate in the China Sea vicinity, the wind has usually increased to about force 6.

When proceeding through an area liable to be visited by these storms it is desirable to take hourly readings of the barometer.

(*b*) An appreciable change in the direction and/or strength of the wind.

(*c*) A swell is sometimes evident, proceeding from a direction that approximates to the bearing of the centre. If ahead of the storm this indication may be apparent before the barometer begins to fall.

(*d*) Extensive cirrus cloud followed, as the storm becomes closer, by much alto-stratus cloud and subsequently fracto-cumulus or "scud."

(*e*) In addition there is the warning that can be given by Radar. The existence of moderate or heavy rain can usually, under favourable meteorological conditions, be detected at the extreme range of centrimetric radar, such as is normally used for navigational purposes afloat, depending on the vertical extent of the rainfall. Subrefraction might decrease and superrefraction increase this range as with any other target. Although moderate or heavy rain does not fall symmetrically all round a storm, it is continuous for at least 50 miles in a broad sector extending from the " eye " of the storm where there is a circular area of relatively light winds and clear or partially clear sky. By the time radar evidence of the exact position of the storm is available, the ship will probably be already in fairly high seas and experiencing winds of force 9 or 10. There should still be time, however, for her to avoid the centre of the storm.

Note.—In accordance with Article 35 of the International Convention for Safety of Life at sea it is the duty of every ship who suspects the presence or formation of a tropical revolving storm immediately to inform other vessels and shore authorities with all the means at her disposal. Weather reports should be made by radio at frequent intervals giving as much information as possible, especially corrected (*not* for diurnal variation as in (*a*) above) barometer readings. If barometer readings are uncorrected this fact should be stated in the signal.

Information required by the seaman before deciding upon action to be taken.—To decide on the best course of action if a storm is suspected to be in the vicinity, the mariner requires to know:—

(*a*) the bearing of the centre of the storm;
(*b*) the semicircle in which the ship is situated;
(*c*) the path of the storm.

If an observer faces the wind, the centre of the storm will be from 9 to 11 points on his right-hand side in the northern hemisphere when the storm is about 200 miles away, i.e., when the barometer has fallen about 5 millibars and the wind has increased to force 6 or thereabouts; as a rule the nearer one is to the centre the more nearly does the angular displacement of the wind approach 8 points. A further check on the bearing of the centre may often be obtained by noting the direction from which the swell is coming. The swell travels approximately directly outward from the storm centre.

The semicircle in which the ship is situated can be determined by taking two such bearings with an interval of from two to three hours between observations, provided that allowance is made for the ship's movement. It can be assumed that the storm is not travelling towards the equator; and, if in a lower latitude than 20°, its path is most unlikely to have an easterly component; and, on the rare occasions when neither of these statements applies, the storm is moving very slowly. (Exceptions to this are most likely in the South Pacific, where occasional storms often move off on a course almost due south developing an easterly component at a latitude of about 15°, and in the western

North Pacific where some of the out-of-season storms may recurve at an early stage.)

In a moving ship associated with a storm progressing at an unknown rate, it is very difficult to estimate from an apparent shift of wind the direction and speed of the storm's motion relative to the ship. The surest method of ascertaining the true shift of wind and thereby finding out in which semicircle the vessel is situated, *is to stop the ship during the period between the two bearings.* If in either hemisphere, these observations show that the wind is veering, the ship is in the right-hand semicircle; if the wind is backing she is in the left-hand semicircle; and if the wind remains steady in direction then the vessel is in the direct path of the storm, which is the most dangerous place of all.

The diagram headed " Typical Paths of Tropical Storms " (at the end of this article) illustrates the terms " dangerous semicircle " and " navigable semicircle." The former lies on the side of the path towards the usual direction of recurvature, i.e., the right-hand semicircle in the northern and the left-hand semicircle in the southern hemisphere. It is so called because a sailing or low-powered vessel caught in it may be blown towards the path along which the storm will pass, or the storm may recurve and the centre pass over her. The navigable semicircle is that which lies on the other side of the path. A ship situated within this semicircle will tend to be blown away from the storm centre, and the recurvature of the storm will increase her distance from the centre.

Practical rules for avoiding tropical storms.—In whatever situation a ship may find herself, the matter of vital importance is to avoid passing within 50 miles or so of the centre of the storm; it is preferable to keep outside a radius of 200 miles or more, because at this distance the wind does not often exceed force 7 (and is generally not more than force 6), and freedom of manœuvre is maintained. If a ship has at least 20 knots at her disposal, and shapes a course that will take her most rapidly away from the storm before the wind has increased above the point at which her movement becomes restricted, it is seldom that she will come to any harm.

Sometimes a tropical storm moves so slowly that a vessel, if ahead of it, can easily outpace it or, if astern of it, can overtake it. Since, however, she is unlikely to feel seriously the effects of a storm so long as the barometer does not fall more than 5 mb. (corrected for diurnal variation) below the normal, it is recommended that frequent readings should be made if the presence of a storm in the vicinity is suspected or known, and that the vessel should continue on her course until the barometer has fallen 5 mb., or the wind has increased to force 6 when the barometer has fallen at least 3 mb. If and when either of these events occurs, she should act as recommended in the following paragraphs, until the barometer has risen above the limit just given, and the wind has decreased below force 6. Should it be certain, however, that the vessel is behind the storm, or in the navigable semicircle, it will evidently be sufficient to alter course away from the centre.

In the northern hemisphere.—(*a*) If the wind is veering, the ship must be in the dangerous semicircle. A steam or other power-driven vessel should proceed with all available speed with the wind 1 to 4 points (depending upon her speed) on the starboard bow, and should subsequently haul round to starboard as the wind veers, thereby tracing a course relative to the storm as shown by the pecked line in the diagram. If a steamer has insufficient room to make much headway when in the dangerous semicircle she should heave to in the most comfortable position relative to the wind, preferably with the wind on her starboard bow so that she is heading away from the centre of the storm.

(*b*) If the wind remains steady in direction, or if it backs, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a steam vessel should bring the wind well on the starboard quarter and proceed with all available speed, subsequently altering course to port as the wind backs, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

In the southern hemisphere.—(*a*) If the wind is backing, the ship must be in the dangerous semicircle. A steam or other power-driven vessel should proceed with all available speed with the wind 1 to 4 points (depending upon her speed) on the port bow, and should subsequently haul round to port as the wind backs, thereby tracing a course relative to the storm, as shown by the pecked line in the diagram. If a steamer has insufficient room to make such headway she should heave-to in the most comfortable position relative to the wind, preferably with the wind on her port bow so that she is heading away from the centre of the storm.

(*b*) If the wind remains steady in direction, or if it veers, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a steam vessel should bring the wind well on the port quarter and proceed with all available speed, subsequently altering course to starboard as the wind veers, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

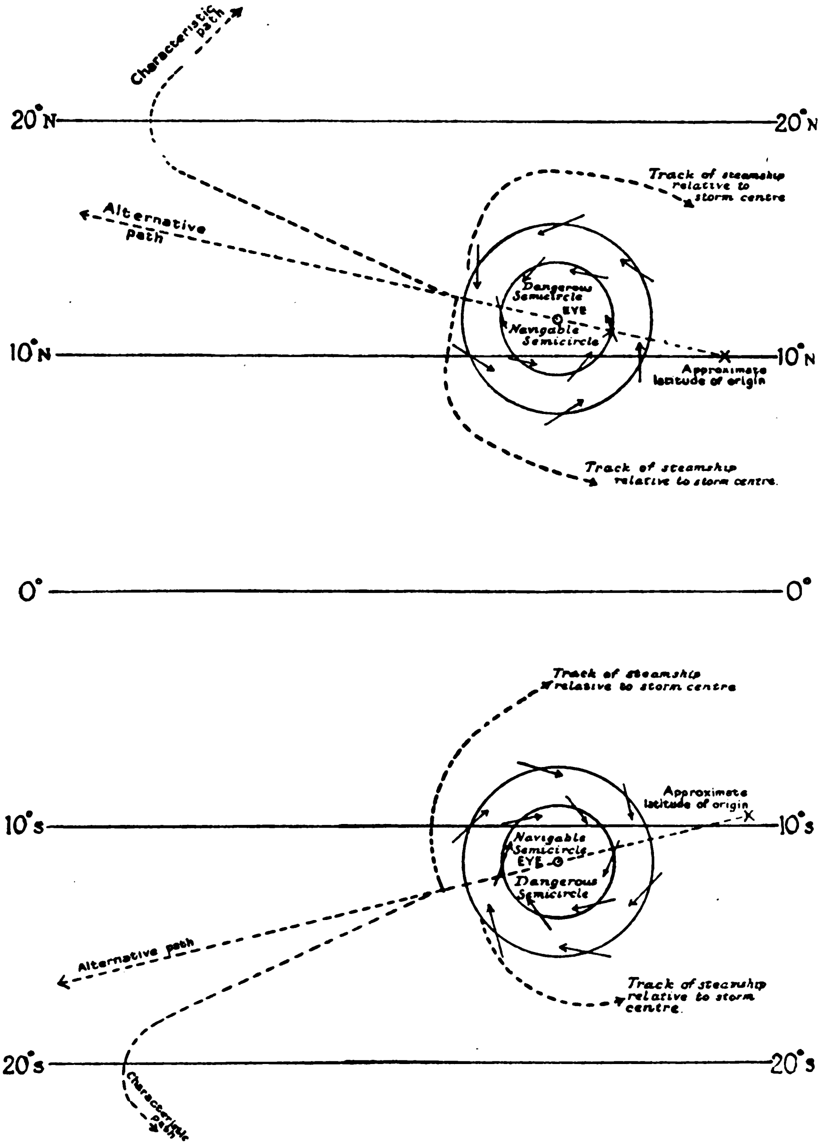
If there is insufficient room to run when in the navigable semicircle, and it is not practicable to seek a safe and effective shelter before the storm begins to be felt, a vessel should heave-to in the most comfortable position relative to the wind and sea, bearing in mind the proximity of land.

If a ship finds that she is in the direct path of the storm and has no room to run into the navigable semicircle as directed above, it should be considered, bearing in mind possible recurvature, whether she should endeavour to make her way into the " dangerous " semicircle (where she may at least be better off than remaining in the direct path of the storm) and continue to steam to windward as fast as she can so as to get as far as possible from the centre.

If in harbour, or at anchor, a seaman should be just as careful as at sea in watching the shifting of the wind and estimating the movement of the storm relative to himself, so that he may consider shifting his berth with advantage or otherwise act according to circumstances. It is usually preferable, however, to put to sea if this can be done in sufficient time to avoid the worst of the storm. Riding out a tropical storm, the centre of which passes within 50 miles or so, in a harbour or anchorage, even if some shelter is offered, is an extremely unpleasant and hazardous experience, especially if there are other ships in company. Even if berthed alongside, or with special moorings and long bridles in use, a ship cannot feel entirely secure.

Discretion must, of course, be used. In the case of a low-powered or small vessel with, for example, insufficient warning to enable her to

TYPICAL PATHS OF TROPICAL STORMS


Characteristic path
20°N
20°N
Alternative path
Track of steamship relative to storm centre
Dangerous Semicircle
EYE
Navigable Semicircle
10°N
10°N
Approximate latitude of origin
Track of steamship relative to storm centre
0°
0°
Track of steamship relative to storm centre
Approximate latitude of origin
10°S
10°S
Navigable Semicircle
EYE
Dangerous Semicircle
Alternative path
Track of steamship relative to storm centre
20°S
20°S
Characteristic path

Note.—In this diagram the isobars are shown as concentric circles about the eye; in practice this is usually the case within 150 miles or so of the centre. Outside this distance the isobaric form often loses its symmetry and strong winds often extend farther on the polar side than on the equatorial.

gain sufficient distance from the storm by putting out to sea, it will be preferable to remain in a reasonably sheltered harbour. If at sea and warning of an approaching storm is given and there is considered to be insufficient time or sea room to avoid the dangerous part of the storm area, it may be advisable for vessels of this type to seek shelter. In the China Sea, for example, there are so-called typhoon harbours which are listed in the Admiralty Pilot. In all cases, however, the mariner must use seamanship and initiative.

(3) **Local modification of the weather near the coast.**—The information given in Chapter I on climate and weather in the area covered by the Pilot refers necessarily to the coastal and sea regions generally but cannot attempt to deal with the local effects on the wind and weather of each separate headland, bay, or creek. The following notes, however, should prove helpful in showing how the weather in the general vicinity is likely to be modified by the topography or shape of the land close to the actual place in which the mariner is concerned.

(i) If the coastline is steep-to, onshore winds that approach it at an angle are usually deflected nearly along the shore and increased somewhat in speed. And when the wind approaches a strait whose direction is somewhat similar to that of the wind, the wind tends to blow along the strait and increases in speed as the strait narrows.

When a strong wind blows directly towards a very steep coast, there is usually a narrow belt of contrary gusty winds close to the coast.

(ii) Similarly when the wind blows onshore towards the entrance to a wide estuary, especially one with hills on both sides, it generally tends to blow up the estuary. This effect is most marked in the afternoon but there is often no such tendency during the night and early morning.

(iii) An offshore wind is often squally on the lee side of hilly coasts, especially when the air is much colder than the sea, as for example when it blows off snow-covered land and when the wind over the open sea is force 5 or more.

(iv) Near headlands or islands with steep cliffs there may be large changes in direction (up to about 90°) and speed of the wind in addition to those mentioned above.

(v) During quiet and warm weather with clear or fairly clear skies, a sea breeze is of common occurrence during the warmer part of the day; it is especially frequent in the tropics and subtropics. It blows onshore from, on the average, 4 to 8 hours after sunrise until shortly before sunset, reaching its maximum development during the afternoon (1300 to 1600); if there is an appreciable regional or general wind, then this will be modified by the onshore sea breeze. Under particularly favourable circumstances such as high dry temperatures, relatively cool sea, and hilly background to coast, the sea breeze may blow as much as force 4 (occasionally 5) and extend 20 miles or more to seaward from the shore. At night under similar circumstances a lighter breeze blows from the land to the sea; it seldom extends more than 5 miles from the shore nor does it become appreciable much before 2200 local time; under favourable conditions, as in the tropics, it usually lasts until an hour or so after sunrise.

(vi) When sea fog that is caused by the passage of warm air over a colder sea surface is general over the open sea, visibility is better close to leeward of a hilly island or promontory than to windward. This effect is most marked in late spring and summer, during the early afternoon when the land is at its warmest, and then applies to low-lying land as well.

(vii) Radiation fog which forms over land on quiet nights with clear skies, mainly in autumn and winter, and sometimes spreads a few miles out to sea, is least thick during the afternoon and is often worst during the first hour or two after sunrise.

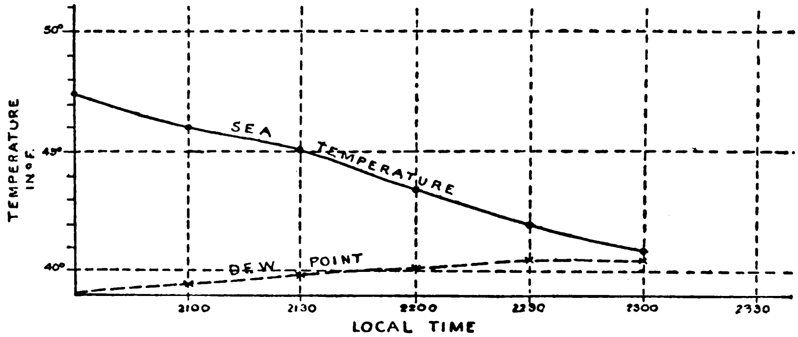
(4) **Forecasting sea fog.**—The most frequent type of fog in the open sea is that caused by relatively warm air flowing over a colder sea. Warning of this type of fog may be obtained by frequent observations of air and sea surface temperatures; if the sea temperature falls below the dewpoint of the air, fog is almost a certainty. The following procedure is recommended whenever the temperature of the air is higher than, or about equal to, that of the sea, especially at night when approaching fog cannot be seen until shortly before entering it.

Sea and air (both dry and wet bulb) temperatures should be observed at intervals of about 5 miles and the sea temperature plotted against dewpoint. The dewpoint is obtainable from tables published in various text-books, but at temperatures up to about 60° F. a close enough approximation may be obtained by assuming it to be the same amount below the wet-bulb temperature as the latter is below the dry-bulb temperature; for example, if the dry bulb reads 50° F. and the wet bulb 48°, the dewpoint is about 46°. If the curves of sea temperature and dewpoint converge, fog may be expected by the time at which they coincide.

The figure below represents conditions that might be found by a low-powered ship in about long. 40° W. proceeding westward on the appropriate lane route for Halifax, Nova Scotia. At 2200 it would become evident that there is a probability of running into fog in about an hour's time, assuming that the sea temperature continues to fall at about the same rate that it has done during the last 1½ hours.

From the appropriate chart of average sea surface temperatures it can be seen where a rapid fall of temperature may be expected, so that if the dewpoint is within 5° or so of the sea temperature when approaching the colder water zone, this will also give a fairly reliable warning of fog.

If it is desirable and practicable to escape from fog, a ship should steer for warmer water which will again be evident from the charted isotherms.



Fog, or very poor visibility, at sea may also occur in snow or heavy rain, or in association with the passage of a warm front or occlusion, or, when within 20 miles or so of land, it may occur as a result of radiation fog extending from the land; in high latitudes in winter, sea smoke may be met near land, when very cold offshore winds are blowing, or near extensive ice. The method described above will not give warning of these fogs, of which frontal fogs, though common in middle latitudes, are neither so extensive nor so persistent in any one locality, and the other fogs mentioned are rarely encountered far from land (or extensive ice).

IMPORTANT.

Details of Lights, Fog Signals, and Time Signals (visual) are not included in this volume; for this information the Admiralty List of Lights, Vols. 6 and 10, should be consulted.

Information regarding Vertical Movement of the Water is not included; for this the Admiralty Tide Tables should be consulted.

Details of Radio information (weather bulletins, storm and navigational warnings, time signals, fog signals, and D.F. stations) are not included; for this information the Admiralty List of Radio Signals should be consulted.

Eastern Archipelago Pilot

VOL. IV

CHAPTER I

GENERAL REMARKS—COCOS ISLANDS—CHRISTMAS ISLAND—EASTERN ARCHIPELAGO AND REPUBLIC OF INDONESIA—JAVA—SUMATRA—ISLANDS EASTWARD OF SUMATRA—BORNEO—CURRENTS—TIDAL STREAMS—SIGNALS—GENERAL SYSTEM OF BUOYAGE—PILOTAGE—COMMUNICATIONS—SHIPPING—FUEL—REPAIRS—STANDARD AND SUMMER TIMES—REGULATIONS—DERATISATION—CAUTIONS—GENERAL DIRECTIONS—CLIMATE AND WEATHER

GENERAL REMARKS.—This work contains a description of the Cocos or Keeling islands, Christmas island and Sunda strait; the eastern coast of Sumatra between Sunda strait and Singapore strait; the islands of Banka and Billiton, Straat Karimata (Carimata strait) including a portion of the western coast of Borneo; Riouw and Lingga archipels; and the inner routes from Straat Banka to Singapore strait.

With the exception of the Cocos islands and Christmas island, all the islands described in this volume form a portion of the Republic of Indonesia. The latter is divided into ten provinces, namely East, Central and West Java; North, Central and South Sumatra, known to the Indonesians as Andalas; Borneo, known to the Indonesians as Kalimantan; Celebes, known to the Indonesians as Sulawesi; the Moluccas, known to the Indonesians as Maluku; and Kleine Sunda eilanden (Lesser Sunda islands), known to the Indonesians as Sundra ketjil. The province of Central Sumatra includes the Karimun, Anambas, Natuna and Tambelan eilanden as well as a part of Sumatra.

Chart 2510.

COCOS ISLANDS.—The Cocos or Keeling islands are two groups of low coral islands, of the atoll type, 15 miles apart, and nearly 600 miles south-westward of Sunda strait. The southern, and larger group, is inhabited; copra, coconut-oil and nuts are exported.

These islands were discovered in 1608 by Captain William Keeling in the service of the East India Company, but were little known previous to the visit of Captain J. Clunies Ross, of the ship *Borneo*, who partially refitted his ship here in 1825. Captain Ross returned

Chart 2510.

to the islands in 1827 with some Scottish colonists, but found them occupied by Alexander Hare, who, with a large number of Malay followers, had arrived the same year. The two factions lived on bad terms, and many of Ross's colonists left the place owing to its being already occupied, but eventually the Ross influence became the stronger, and Hare, deserted by his followers, left. The Ross family now own the islands.

In 1836, the Cocos islands were visited by Captain Robert Fitzroy, who surveyed the group; the southern group was again surveyed in 1944–1945.

In 1857, Captain Stephen G. Fremantle, in H.M.S. *Juno*, formally annexed the group to the British Crown. In 1878 the islands were placed under the government of Ceylon. In 1886 they were placed under the Governor of the Straits Settlements, and, in 1903, they were annexed to the Straits Settlements and incorporated in the Settlement of Singapore. The islands are at present under the administration of the Government of Singapore, which is represented by a Malayan Civil Service Administrator. In 1951, H.M. Government announced their agreement to the transfer of these islands to Australian administration, but the transfer has not yet taken place.

Population.—The estimated population in mid-1951 was 1,217 including 18 Europeans.

Communications.—*See* page 47.

Chart 3504.

CHRISTMAS ISLAND.—Christmas island lies about 220 miles southward of the south-western extremity of Java, and is near the track of sailing vessels bound for Sunda strait from the Cape of Good Hope between April and September, and to those bound southward from Sunda strait during the period of the north-west monsoon.

The East India Office Records contain a letter from a Captain William Mynors, stating that he sighted this island on Christmas day, 1643, and gave it the name of Christmas island. It is also shown on a map by Pieter Goos, published in Holland in 1666, on which it is named Moni. In 1688 Dampier landed on the island, and an account of it is given in his "Voyages." Christmas island was annexed to the British Crown by Captain W. H. May, R.N., in H.M.S. *Imperieuse*, on 6th June, 1888; it is a dependency of the Colony of Singapore and is administered by a District Officer of the Malayan Civil Service; there is a small police force.

A settlement was first formed in 1888 in Flying Fish cove, on the northern side of the island, when coconut trees were planted along the shore, and coffee, cocoa, and pepper in clearings behind; these have all died out completely, although the coconut trees still thrive. Large deposits of phosphate of lime exist on the island, and this is now the sole export. Before 1948, the deposits of phosphate of lime were worked by the British Phosphate Commissioners but in that year a new company, representing the Australian and New Zealand Governments, called the Christmas Island Phosphate Company, Ltd., leased the industry and now employ the British Phosphate Commissioners as its agent.

Population.—The population of Christmas island, in mid-1951, was 1,522, consisting of 1,138 Chinese, 303 Malays, 4 Indians or Pakistanis and 77 Europeans.

Communications.—*See* page 51.

Charts 2760, 941a, 941b.

EASTERN ARCHIPELAGO AND REPUBLIC OF INDONESIA.—The history of the present-day Eastern Archipelago appears naturally to fall into two great periods, the dividing line of which lies in about the year 1500. In the period before that date Hinduism held supreme sway in the most important islands; towards the end of the fifteenth century Islam had to a great extent superseded Hinduism, and at the same time the first conquerors from Europe, the Portuguese, arrived. In 1596, the Dutch arrived on the scene, and early in the seventeenth century the Netherlands East India Company acted as the principal political power in the archipelago; by the end of that century it had gained absolute control. A century later these colonies were annexed by the State, so that in the nineteenth century and first part of the twentieth century they formed part of the Netherlands Kingdom. The transfer of sovereignty of the major part of the Eastern Archipelago from the Netherlands to the United States of Indonesia took place on 28th December, 1949. On 15th August, 1950, a new provisional constitution was proclaimed and the country named the Republic of Indonesia.

The Eastern Archipelago is one of the most important volcanic territories of the entire globe; Sumatra and Java form a portion of a volcanic arc which continues eastward throughout Kleine Sunda eilanden. This recent volcanism has made the soil of Java so fertile that it is one of the most densely populated agricultural areas of the world.

Republic of Indonesia.—The Republic of Indonesia comprises the islands of Java and Madura, the island of Sumatra, Riouw and Lingga archipels (which with the Karimun, Anambas, Natuna and Tambelan eilanden as well as a part of Sumatra form part of the Province of Central Sumatra), the islands of Banka and Billiton, part of the island of Borneo, Celebes, the Molucca islands, part of Timor island, and the islands of Bali and Lombok. For provincial divisions, *see* page 1.

The Republic of Indonesia is a sovereign independent state, associating with the Kingdom of the Netherlands on a voluntary and equal basis. The governing authority is vested in a President and the legislative power is vested in the House of Representatives. The capital of the Republic is situated at Djakarta (Batavia) in Java; the British Ambassador Extraordinary and Minister Plenipotentiary resides at that place.

Inhabitants.—The principal races are the Achinese, Bataks and Menangkabaus in Sumatra, the Javanese and Sundanese in Java, the Madurese in Madura, the Balinese in Bali, the Sasaks in Lombok, the Menadonese and Buginese in Celebes, the Dyaks in Borneo and the Papuas in New Guinea, known to the Indonesians as Irian.

The official language of the Republic is *Bahasa Indonesia* which is understood in the whole country; in addition some 25 main languages are spoken, of which Javanese, Sundanese and Madurese are the most important.

The total population of Indonesia, in 1950, was estimated at 78,000,000.

Monetary system.—The monetary unit is the rupiah, divided into 100 sen. Bank notes are issued of various denominations from one to 100 rupiah.

Weights and Measures.—The metric system of weights and measures is employed.

Charts 2760, 941a, 941b.

The following are the old weights and measures:—

1 Picul = 136.16 lbs. avoirdupois
1 Katti = 1.36 „ „
1 Tjengkal = 4 yards
1 Square paal = 227 hectares = 561.56 acres
1 Bouw = 1.7536 acres
1 Paal (Java) = 1,506 metres
1 Paal (Sumatra) = 1,852 metres.

Products.—Trade.—The chief products are mineral oil, rubber, tin, sugar, coffee, palm-oil, tea, cocoa, tobacco and cinchona; before 1939, about 85 per cent. of the world's supply of pepper was produced but, in 1948, the output had fallen considerably due to destruction of the vines during the World War, 1939–1945.

Communications.—*Railways.*—There is a government railway in Java, also several privately-owned railways and tramways, all towns being accessible by rail; the total mileage, in 1940, was 3,378. Motor buses are run in conjunction with the railways and tramways.

In the north and north-east of Sumatra, there is a narrow-gauge steam tramway which runs from Uleë Lheuë to Langsa, and is known as the Achin Steam Tramway. On the east coast, the Deli railway runs from Tebing Tinggi to Pangkalan-Brandan, via Medan, and is connected to the Achin line.

On the west coast Emma haven is connected with Padang by a railway, which is continued to the Ombilin coalfields, with a branch line to Fort de Kock, known to the Indonesians as Bukit Tinggi, and Pajahumbuh. Priaman and Sungei Limau are also connected with Padang. A Government railway runs from Telukbetung to Palembang and Lahat in South Sumatra.

The other islands in the area contained in this volume have no railways.

Power vessels.—There is regular communication by sea between Europe and Singapore, and Djakarta (Batavia). The Koninklijke Paketvaart Maatschappij maintains regular service to all parts of the Republic of Indonesia, thus connecting them with the main ports, from which there are services to most countries; further details are given in the descriptions of each port or anchorage.

Air service.—Air services are maintained between Djakarta and the more important towns in Java and Sumatra. There is a regular air-mail service between Holland and Java, and between Singapore, Medan and Djakarta; there is also a regular air-service between Java and Australia.

Roads.—A large number of towns and villages are connected by road. In 1941, there was a road mileage of about 43,700 in the Republic of Indonesia; in Java and Madura about 16,850 miles; in Sumatra about 15,800 miles; and in Borneo 2,250 miles.

Consuls.—There are British Consular officers at Djakarta, Sourabaya and Medan.

Charts 941a, 941b.

JAVA.—Java is by far the most advanced of the islands in Indonesia, and has an elaborate railway system, excellent roads, and other means of communication. Only the small portion at the western end of Java, which forms the south-eastern side of Sunda strait, is

Charts 941a, 941b.

dealt with in this volume, and a full description of this island is given in the Eastern Archipelago Pilot, Vol. II.

Chart 748b.

SUMATRA.—Sumatra, known to the Indonesians as Andalas, with an area of 164,148 square miles, is the largest of the islands of the Malay archipelago, except Borneo, and is about three times the size of Java. The equator passes through about the middle of the island.

Sumatra was first visited by the Portuguese in 1508, in 1596 by the Dutch, and in 1685 the British established themselves at Benkulen until 1824, when this territory was ceded to the Dutch in exchange for Malacca, and the entire island now forms part of the Republic of Indonesia.

The small portion at the south-eastern end of Sumatra, forming the northern side of Sunda strait, and the eastern coast of Sumatra between that strait and Singapore strait are described in this work. The former area is a part of the province of South Sumatra, with its capital at Palembang ; and the latter lies both in South Sumatra and, northward of Tanjong Djabung (page 110), in the province of Central Sumatra. The capital of Central Sumatra is at Fort de Kock, known to the Indonesians as Bukit Tinggi.

Physical features.—A lofty chain of mountains, known as the Barisan gebergte, traverses the whole length of the island, rising to numerous volcanic peaks from 5,000 to over 12,000 feet ($1,524^{m}0$ to over $3,657^{m}6$) high, and consists in general of two or more chains running parallel to each other, with a valley between, which is broken up by volcanic massifs, and in it lies a row of lakes, of which Toba is by far the largest. The volcanoes, of which some are still active, are mostly close to the west coast, the western slopes descending steeply towards the ocean and the eastern overlooking a vast alluvial tract of unusual uniformity.

This great alluvial plain, generally only a few feet above the level of the sea, is 600 miles long, and from 60 to 110 miles wide. The south-eastern extremity of the island is little better than a forest of mangrove growing out of a morass. A large part of the island is a sterile or intractable wilderness, and is very thinly populated.

Most of the island of Sumatra dealt with in this volume, with the exception of some high land forming the northern side of Sunda strait, is a portion of the alluvial belt just mentioned and is generally marshy land, intersected by many rivers and covered with vast forests.

The highest peaks in the portion of Sumatra covered by this work are Tanggamus (page 53), 6,896 feet ($2,101^{m}9$) high, at the head of Semangka baai ; Pesawaran (page 63), 5,453 feet ($1,662^{m}1$) high, and Ratai (page 63), 5,518 feet ($1,681^{m}9$) high, lying close to one another, about 26 miles eastward of Tanggamus ; and Radja (Raja) Basa (page 63), 4,203 feet ($1,281^{m}1$) high, near the south-eastern extremity of Sumatra and about 36 miles east-south-eastward of Ratai.

Rivers.—The water courses, owing to the configuration, are comparatively short on the western side, but those on the eastern slope are longer, navigable for small vessels, and in their lower courses, form considerable deltas.

The rivers bring down enormous quantities of debris, which is deposited around their mouths, blocking the channels and adding to the numerous islands and sandbanks by which they are encumbered.

Chart 748b.

It is stated that Palembang, when first founded, was situated at the mouth of the river, from which it is now distant over 40 miles in a direct line.

Kuala Djambi (Jambie river), named Batang Hari in its upper reaches, the largest river in Sumatra, is navigable for small craft, with a draught of 4 feet (1^m2), for a distance of fully 300 miles; it drains a vast area, and is connected with some of the most beautiful and fertile districts of the Padang highlands by its tributaries. Ayer Musi (Palembang rivier) is navigable, during the period of the west monsoon, for a distance of fully 200 miles by small craft with a draught of 3 feet (0^m9).

Minerals.—Gold, copper, tin, iron and lignite of good quality are found in Sumatra; there are several coal mines. In addition, alum, naphtha, sulphur, and saltpetre abound near the volcanoes, and antimony, nickel, cobalt, zinc, quicksilver, bismuth and arsenic are known to exist. For further details, *see* Malacca Strait Pilot.

Flora and fauna.—In the northern part of the island the pine tree has advanced almost to the equator, and in the southern part are a variety of species characteristic of the Australian region. As a timber-producing country the island ranks high among the richly-wooded lands of the archipelago. The *Rofflesia Arnoldi*, the blossoms of which are sometimes 3 feet (0^m9) in diameter, and are the largest known, are found in Sumatra.

The coconut, betel, bamboo, and sugar-cane, and an abundance of tropical fruits are indigenous.

Elephants are represented by a peculiar species. Tapirs, lemurs, and tigers are numerous. The rhinocerus is rarer and is a species peculiar to the island, having two horns; it is found in the marshy jungles of the coast, and also at considerable altitudes.

Products.—Trade.—Buffaloes are the most important live stock; the breed of horses is small, but well made and hardy; sheep also are small.

The staple industry is agriculture, which employs about 90 per cent. of the population. The principal cultivated plants are rubber, tobacco, tea, coffee, copra, rice, maize, sugar cane, areca palms, coconut palms, ground-nuts and spices. The principal fruit trees are tamarind, pomegranate, guava, papaw, orange, and lemon.

In addition, cattle raising, fishing, navigation, and forestry employ a considerable number of people.

The chief articles of export are pepper, petroleum, benzine, tobacco, rubber, hides, coffee, nutmegs, rattans, coral, rice, tapioca flour, camphor, gambier, gutta-percha, copra, and dried fish. Almost all the necessaries of life have to be imported, and the imports are chiefly wool, cotton, haberdashery, tea, provisions, wines, beer, spirits, tin-ware, clothing, metals, hardware, cutlery, matches, motor-cars, cement, drugs, etc.

Inhabitants.—The natives of Sumatra are of the Malayan stock, although the different tribes vary considerably in language, customs, and social conditions. Of the tribes inhabiting the eastern lowlands, those in the Djambi district are true Malays. The people inhabiting the Palembang valley are of like origin, but have been mixed with Javanese settlers, so that their manners and customs, as well as their language, resemble those of that people. At the head waters of Ayer Musi and Batang Hari are the Kubus, totally wild, inhabiting the thickest forest country and avoiding all communication with those

Chart 748b.

not of their own race; they collect forest produce and barter it with the Malay races, leaving the objects of barter on the ground and disappearing until the Malay has in like manner deposited what is considered the equivalent. Southward of the Palembang district, and occupying the southern extremity of Sumatra, are the Lampongers, dwelling in a country fairly well known to Europeans, and leading a settled and agricultural life.

The official language is *Bahasa Indonesia* (the Indonesian language), which is understood in the whole country; Malay is also generally understood, but there are many dialects and, in some cases, distinct languages.

The majority of the natives are Muhammadans, but the religion is not strictly followed, and as a rule they are tolerant of other religionists; the centre of the island is occupied by pagans.

In 1930, the population of Sumatra was 7,677,826, but it has increased considerably since that date.

Principal ports.—The principal ports in the area covered by this volume are Pandjang (Panjang), known to the Dutch as Oosthaven, on the northern side of Sunda strait; Palembang in Straat Banka; and Djambi on the eastern coast.

Chart 2149.

ISLANDS EASTWARD OF SUMATRA.—Banka.—Banka, with an area of 4,610 square miles, lies off the middle part of the eastern coast of Sumatra, and is separated from it by Straat Banka, the main route for all shipping proceeding from Sunda strait to Singapore. The island is comparatively sterile, with numerous valleys and swamps, and covered with thick forest; the surface is rugged and irregular, and the highest mountains are well under 3,000 feet ($914^{m}4$) in height.

The history of Banka practically dates from the discovery of its tin, the Dutch acquiring the monopoly of the metal from the Sultan of Palembang, to whom the island belonged, in 1709. In 1811, when the British gained possession of settlements appertaining to Sumatra, the Sultan, in the hope of gaining favour with them, massacred all the Dutch in his dominions, an act of treachery which was fitly punished by his dethronement by the British. In 1816 the island was again resigned to the Dutch, who remained in possession of it until 1949. It now forms part of the Republic of Indonesia.

The original inhabitants of Banka are few in number; they consist of hill tribes, existing largely on forest produce, and fishermen, who live chiefly in their praus. The bulk of the population is immigrant, and consists mostly of Malays and Chinese. Gold, silver, lead and copper, in addition to tin, have been found on the island; the tin mines are operated by the Government.

Banka is intersected by good roads. Pangkal Pinang, on the eastern coast, and Muntok, at the northern entrance to Straat Banka, are the principal towns.

Population.—In 1930, the population of Banka was 205,363, but it has increased considerably since that date.

Chart 2160.

Billiton.—Billiton, separated from Banka by Gaspar straten, resembles that island geologically and also contains alluvial deposits of tin, which are operated by a combined governmental and private undertaking. The island has an area of 1,866 square miles. It is

Chart 2160.

mostly covered with dense forest. The principal town and port is Tandjung Pandan, situated on the western coast.

Billiton is sparsely populated, and few inhabitants will be seen except in the mining districts. The Orang Sekah people are found on the coasts and also in the Momparang eilanden; they are mainly fishermen, living almost entirely in their praus. They are entirely different from the earlier inhabitants of the island, the Orang Darat, who have the same customs and habits as the Malays and belong to the Islam faith, whereas the Orang Sekah are heathens.

Population.—In 1930, the population of Billiton was 73,429, but it has increased considerably since that date.

Chart 2757.

Riouw and Lingga archipels.—Riouw and Lingga archipels comprise a vast number of islands, reefs and shoals lying off the northern part of the eastern coast of Sumatra. In Lingga archipel, which forms the southern group, are the two large islands Singkep and Lingga; in Riouw archipel are Batam and Bintan, two islands which considerably exceed the remainder in size. Geologically, all these islands are continuations southward of the Malay peninsula, being formed of granite and sandstone, and in every way differing from the low alluvial formations of the eastern coast of Sumatra.

The inhabitants of these islands consist mainly of Malays, Buginese and Chinese. The original natives were a hardy, seafaring race, but now they lead a settled life and their numbers are small. The Malays and Buginese live chiefly by fishing, whilst most of the cultivation is in the hands of the Chinese, gambir and pepper being large exports. Tin is found on Singkep.

Except for the people who dwell in the forests, who are pagans, the natives profess the Muhammadan faith, although they still worship spirits.

Population.—In 1930, the population was 298,225, but it has increased considerably since that date.

Health.—Riouw and Lingga archipels are unhealthy on account of malaria. The heat by day is accentuated by the rocky and sandy nature of the land; the nights are generally cool, with a heavy dew.

Principal ports.—The principal ports and roadsteads in Riouw and Lingga archipels are Tandjung Pinang (page 209), Tandjung Uban (page 205), and Sungai Kolak (page 197) in Bintan, and Dabo (page 214) in Singkep.

Chart 1263.

BORNEO.—Borneo, known to the Indonesians as Kalimantan, occupies a central position in the Eastern Archipelago, being almost equally accessible from Sumatra, Java, Celebes, the Philippines, and Singapore. It has an area of about 290,000 square miles, of which 210,285 square miles belong to the Republic of Indonesia. Only a portion of the western side of Borneo, between Tanjong Sambar and Tanjong Saleh, which forms the eastern side of Straat Karimata, is described in this volume. This part of the western coast of Borneo is mostly low, marshy, and sparsely populated; Sukadana is the only place of any importance. Several rivers flow out along this coast, but their mouths are only accessible by small craft at high water, with the exception of some of the mouths of the delta of Sungei Kapuas (Groote Kapoeas rivier) which form portions of the inner routes to Pontianak and which are described in this volume.

Inhabitants.—The aborigines of Borneo are of Malay race and are

Chart 1263.

generally known as Dyaks, but they are divided into numerous tribes, speaking distinct languages; they scarcely differ physically from other Malays, except that they are generally lighter in hue and are more active. Several other races have settled in Borneo, which, owing to its central position, has naturally become the receptacle of wanderers from the surrounding islands; Chinese have settled in large numbers. In 1930, the total population of Indonesian Borneo was 2,168,661, including 5,765 Europeans, but the native population has increased considerably since that date.

Products.—Trade.—The chief exports are rubber, tobacco, copra, and other agricultural products; the production of mineral oil is steadily increasing, and tin, coal, and gold are also found.

Health.—The climate of the greater part of Borneo is humid and oppressive, with uniformly high temperatures, although in the hills and interior regions a comparatively temperate climate may be found. The island is probably only a little less healthy for Europeans than Java, but fevers, dysentery, and numerous other diseases are prevalent amongst the natives.

Principal ports.—The principal ports in the area covered by this volume are Sukadana (page 176) and Ketapang (page 174).

CURRENTS.—The currents in the region of Straat Karimata and Gaspar straten and the Java sea are wind-drifts produced by the monsoons blowing seasonally, but in soundings they are affected by the tidal streams.

Under the influence of the south-east monsoon, the current sets in a westerly direction in the Java sea, and in a north-westerly direction through Straat Karimata and Gaspar straten; this flow passes into the north-easterly current of the China sea. During the north-west monsoon the current is reversed and sets south-eastward through these straits, and eastward in the Java sea; this flow is continuous with the south-westerly current of the China sea.

The set through Sunda strait is in a south-westerly direction, and is nearly constant throughout the year.

Caution.—Observations of current in the whole of this region are not numerous and are therefore insufficient to give detailed information. It is known, however, that the currents show a considerable degree of variability, in common with the monsoon drifts of other regions. Not only do they vary according to the changes of strength and direction of the monsoon wind at the time, but currents in other directions, including those in opposition to the monsoon drift, are sometimes experienced.

Figures 1–4 on pages 10 and 11 show the general surface circulation in January, April, July and October respectively.

Region south of the equator, including Straat Karimata and Gaspar straten.—From May to August inclusive the general direction of current flow is north-westward. September is the transition month, when the currents southward of the equator are variable, while the flow through Straat Karimata and Gaspar straten is mainly north-eastward.

From October to March inclusive the general direction is south-eastward. April is the month of transition. In this month while the set in Straat Karimata remains south-eastward that through Gaspar straten is southerly; in the region southward of both straits the direction turns gradually to south-westward.

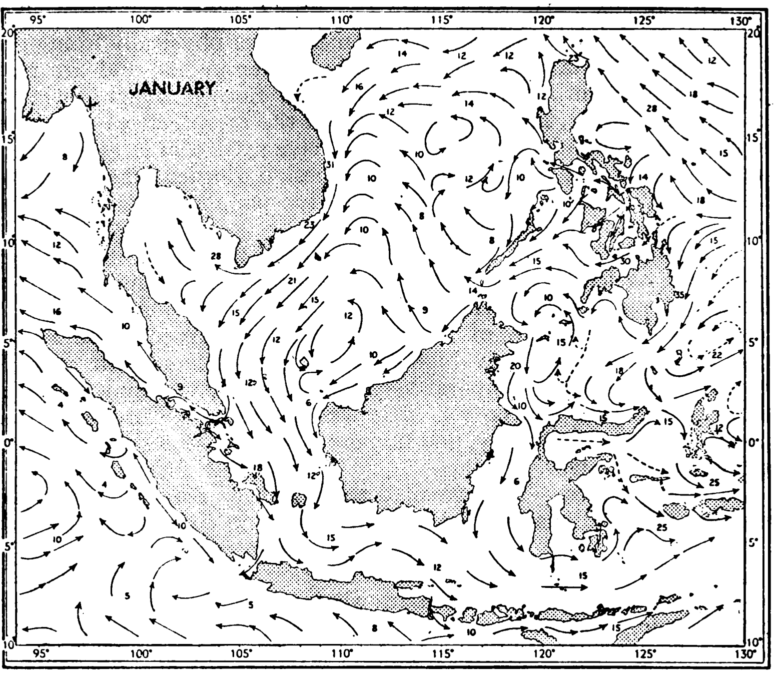

JANUARY
95°
100°
105°
110°
115°
120°
125°
130°
20
15°
10°
5°
0°
5°
10°

Fig. 1.

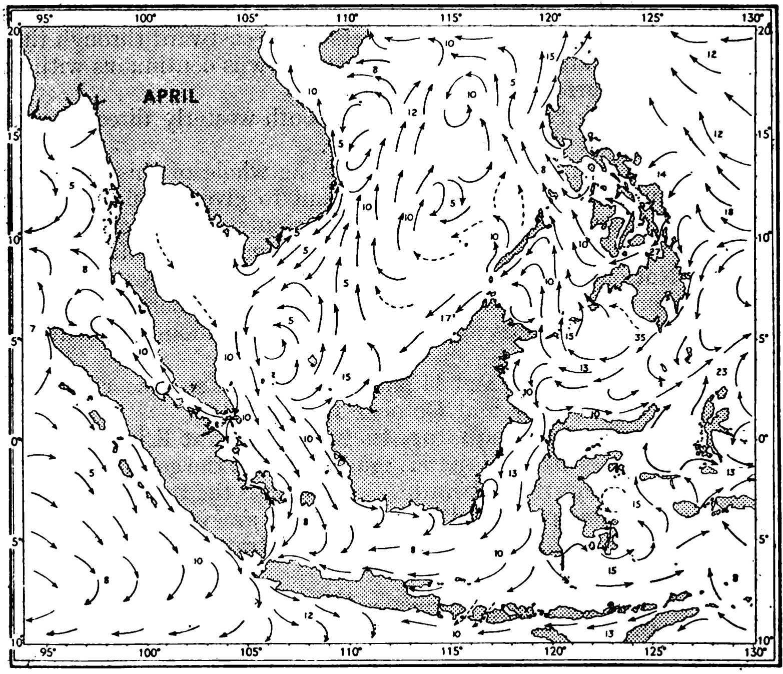

APRIL
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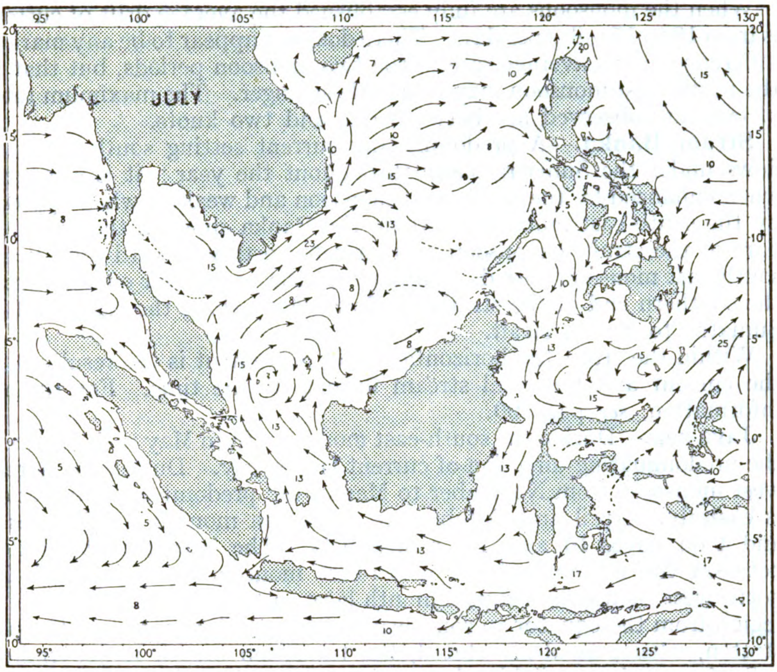
Fig. 2.


JULY
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15°
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13
17
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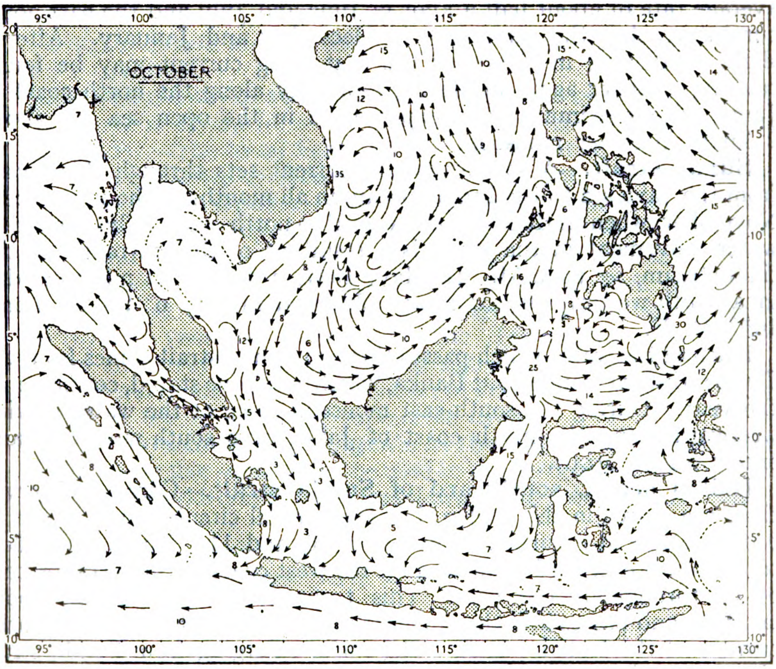
Fig. 3.


OCTOBER
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125°
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12
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35
9
8
6
16
25
14
30
3
5

Fig. 4.

When the monsoons are fully established the average drift of current is from 10 to 15 miles per day. There does not appear to be any marked difference in the average rate in the two monsoon periods, but that of the north-west monsoon may be a little stronger. The maximum rates of currents observed are between one and two knots.

Straat Banka.—A predominating current setting south-eastward flows under the Sumatra shore throughout the year; it is strongest when enhanced by the north-west monsoon and weakest when opposed by the south-east monsoon. Along the Banka shore in the southern part of the strait a monsoon current sets north-westward during the south-east monsoon period. Throughout the year water emerges from the southern end of the strait and flows south along the east coast of Sumatra to Sunda strait.

Within the strait the horizontal water movement is the resultant of the current and the tidal stream flowing at the time. For further information, *see* page 90.

Java sea.—During the south-east monsoon, from May to September, the predominating direction of current is westerly. During the north-west monsoon, from November to March, the predominating direction is easterly. April and October are transition months, *see* Figures 2 and 4 on pages 10 and 11, respectively. The period of transition between the currents of the south-east monsoon and those of the north-west monsoon is thus a month later in the Java sea than in the region from the equator to southward of Straat Karimata and Gaspar straten, where, as above stated, the transition month is September.

So far as the available observations show there is no appreciable difference between the average rates of the west-going and east-going currents in this sea. The west-going current reaches its greatest average rate of about half a knot in June and July and the east-going current reaches the same rate in December and January. After a slight weakening in February the east-going current may be found running stronger again in March, especially along the north coast of Java. The maximum rates experienced in the open sea are about 2 knots in either monsoon.

Sunda strait.—A south-westerly current sets through this strait, from the Java sea to the Indian ocean, in all months of the year except November, when its direction is reversed to north-east. The horizontal water movement in the strait is a resultant of this current and the tidal stream, *see* page 54. In May, 1927, a drift of 41 miles per day in a south-westerly direction was observed in Lat. 6° 20′ S., Long. 105° 34′ E.

Much of the water which passes through Sunda strait comes from the flow southward from Straat Banka, which, as above stated, continues all the year. During the south-east monsoon some of the water flowing westward along the north coast of Java turns south-westward and enters Sunda strait.

Indian ocean, southward of Sunda strait.—Current observations are scarce in this region, but the general circulation is shown in broad outline in Figures 1–4 on pages 10 and 11. There is a flow to the south-eastward along and off the west coast of Sumatra, or part of it, throughout the year. This turns south-westward in about lat. 7° S. and passes into the northern part of the west-going Equatorial current of the Indian ocean. The water emerging from Sunda strait also passes into this current. The part of the Equatorial current north of lat. 10° S. is least regular in direction during the north-west monsoon period, December to February, *see* Figure 1 on page 10.

TIDAL STREAMS.—The tidal streams in the area covered by this volume have a marked diurnal inequality which generally increases eastward. One stream of the day in each direction is markedly stronger than the other and, in many areas, there is only one stream of any strength in each direction per day. Also the strength of the tidal streams, in general, decreases from west to east of the area; whereas rates exceeding 3 knots occur in many channels in Riouw and Lingga archipels, rates rarely attain one knot off Billiton and the western coast of Borneo.

In the open sea the tidal streams are generally weak and, in general, negligible compared with the seasonal wind currents described on page 9.

Even in those straits where the tidal streams are strong, the seasonal currents are not negligible and their contribution to the water flow should not be neglected. Full details of the tidal streams and coastal currents are given in their appropriate places in the body of this work.

SIGNALS.—Vessels inconvenienced by searchlights.—In the event of the navigation of a vessel being inconvenienced by the glare from searchlights near a port in the British Empire, she should make the International Code signal ZO (— — • • — — —) by lamp and by whistle, siren or fog horn.

Both the light and sound signals should be employed, whenever possible, and should be repeated until the inconvenience is removed.

Only real urgency should necessitate the use of this signal as, unless the vessel is actually in the rays of a searchlight, it is not possible for the operators to know which projector is affected.

This signal is designed to assist mariners; no liability whatever will be admitted.

This signal should also be used in similar circumstances near ports in other countries.

Light-vessels out of station.—In the Republic of Indonesia, when a light-vessel is driven from her proper position the following signals will be made:—The usual light will not be exhibited, but a *red fixed* light will be exhibited at each end of the vessel, and a *red* and a *white* flare will be shown simultaneously at least every quarter of an hour; if the use of flares is impracticable a *red* light and a *white* light will be shown simultaneously. By day, the distinguishing daymark will be struck if practicable, a black ball will be shown at each end of the light-vessel, and the International Code signal PC will be displayed.

Surveying vessels.—Vessels of the Indonesian Government employed on surveying duties show the signals prescribed in the International Regulations for the Prevention of Collision at Sea for a vessel employed in laying or lifting submarine cables.

General communication signals in the Republic of Indonesia.—The following flag signals may be used in the harbours of the Republic of Indonesia, in addition to those laid down in the International Code of Signals:—

A.—Displayed on shore.—

3 Pendant	A	*Your berth is Pier	I.
,, ,,	B	* ,, ,, ,, ,,	II.
,, ,,	C	* ,, ,, ,, ,,	III.
,, ,,	D	* ,, ,, ,, ,,	IV.
,, ,,	E	* ,, ,, ,, ,,	V.
,, ,,	F	* ,, ,, ,, ,,	VI.
,, ,,	G	* ,, ,, ,, ,,	VII.

3 Pendant R	*You must anchor in the road.
Blue flag.	No communication owing to bad weather.

*When two or more vessels are entering a harbour at the same time, the berthing signal for one particular vessel can be indicated by hoisting the company or national flag of that vessel below the signal.

B.—Displayed on board.—

1 Pendant H	I need dock assistance.
2 „ M	Please send a motor boat.
3 „ J	Water flag.
1 „ N	I have passengers from outside the Republic of Indonesia who wish to disembark.
2 „ V	I require an ash-boat.
3 „ Q At night, a *red* light above a *white* light, 6 feet (1^{m}8) apart.	I have, in my opinion, one or more cases of an infectious nature on board, or taken on board during the voyage.

Flag B of the International Code of Signals (I am loading or discharging inflammable material or explosives) can also be used to denote " I am loading or discharging light inflammable material."

Vessels requiring the Company's doctor can display their Company's flag *above* flag W of the International Code of Signals.

Tidal stream signals in the Republic of Indonesia.—

Signal.	*Signification.*
White flag.	Slack water.
Blue flag.	Ebb or out-going tide.
Red flag.	Flood tide.

GENERAL SYSTEM OF BUOYAGE.—The general system of buoyage in the Republic of Indonesia is as follows :—

The term starboard-hand means that side which would be on the right-hand for a vessel entering a harbour, river, or estuary, from seaward, or going in the main direction of the flood stream ; the term port-hand means the left-hand side, under the same circumstances.

On the starboard-hand of a channel are :—

(*a*) Light-buoys, painted white, exhibiting a *white* or a *green* light.
(*b*) Lantern-buoys (flat with a pyramidal structure), painted white, exhibiting a *green* light.
(*c*) White conical buoys.
(*d*) Iron beacons surmounted by a white ball.

On the port-hand of a channel are :

(*a*) Light-buoys, painted black, exhibiting a *white* or a *red* light.
(*b*) Lantern-buoys, painted black, exhibiting a *red* light.
(*c*) Black can buoys.
(*d*) Iron beacons surmounted by a black truncated cone.

Buoys marking the approach to harbours and channels, etc., termed " verkenningstonnen," are painted red and black in horizontal bands, and are either light-buoys, exhibiting a *white* light, or conical buoys surmounted by a ball of the same colour as the buoy.

Light-buoys, painted black and white in horizontal bands, exhibiting a *white* light, and conical buoys, painted black and white in horizontal bands, surmounted by a ball of the same colour, give the position where a channel divides, the junction of two channels or the beginning or end of a shoal lying in mid-channel. These can also be indicated by iron beacons, surmounted by a white ball either above or below a black truncated cone.

Black and white chequered light-buoys, exhibiting a *white* or a *red* light, and black and white chequered conical buoys surmounted by a ball of the same colour, indicate a detached danger or a measured distance.

Beacons marking a detached danger are provided with one or two white balls, or one or two black truncated cones, according to which is most plainly visible.

Wrecks are marked by green conical buoys or green can buoys, according to whether the wreck lies on the starboard- or port-hand of the fairway; should the wreck lie in mid-channel it will be marked by a conical buoy on the starboard-hand of the channel, and a can buoy on the port-hand of the channel.

Telegraph buoys and buoys marking a firing ground are red conical buoys, with or without a ball topmark, or buoys of various structures; whenever the buoys denote the starboard- or port-hand of a channel, the usual white conical and black can buoys serve as telegraph buoys.

Whenever it is necessary for a light-buoy, buoy, or beacon to be distinguished from the others of a similar kind lying in the vicinity, the following special marking is used:—

(*a*) Instead of red and black or black and white horizontal bands, vertical stripes are used.

(*b*) Instead of black and white chequers, the buoys are painted in red and black chequers.

(*c*) If the buoy is a white conical buoy, it is surmounted by a white ball; if it is a black can buoy it is surmounted by a black truncated cone.

(*d*) Above the single topmark of a beacon a second topmark of the same colour and shape is placed.

The light of a light-buoy is *occulting* or *flashing*, that of a lantern buoy is *fixed*. Instead of a *white* light a *green* or *red* light may be used, depending on the local circumstances (the distance the light must be seen, or the chance of confusing it with fishing lights, etc.).

In some places privately maintained buoys and beacons of various shape and colour are found, but no reliance should be placed on these.

Reflectors.—Reflectors, consisting of three mirrors disposed vertically, have been erected on the banks of some of the rivers in the Republic of Indonesia, and also on some buoys, as an assistance to navigation at night. Every beam of light which strikes this apparatus at an angle of less than 45° with the axis is reflected back parallel to itself; thus, if an observer on board holds a light directed on the reflector, the light will be reflected back to the vessel. To prevent being dazzled, it is recommended that only ordinary torches with a highly concentrated light derived from 3 to 5 dry batteries should be employed. Under normal conditions on a dark night it can then be reckoned that the reflector will be picked up at a distance of about half a mile, and with heavy rainfall at a distance of from one to 1½ cables.

The direction of the axis line of the reflector, where given, must be laid off from the reflector.

PILOTAGE.—Pilotage is compulsory for all the ports in the Republic of Indonesia at which pilots are available. Pilotage signals for the various harbours and coasts in the Republic of Indonesia, which apply also to light-vessels equipped to show signals connected with the pilot service, are as given hereafter. The term " by day " indicates between sunrise and sunset, and " at night " indicates the remainder of the 24 hours.

Pilot signals.—The following signals are to be made by vessels entering and requiring a pilot :—

By day : (*a*) The National flag, surrounded by a white border one-fifth the breadth of the flag, hoisted at the foremast head.
or (*b*) The pilot signal, " P.T." of the International Code of Signals.
or (*c*) Flag " G " of the International Code of Signals.
or (*d*) The distant signal, consisting of a cone point upwards, having above it two balls or shapes resembling balls.

At night : (*a*) A *blue* light every fifteen minutes.
(*b*) A bright *white* light, flashed or shown at short intervals, just above the bulwarks, for about one minute at a time.
(*c*) The signal " P.T." in the Morse code made by flashing lamp.

The above signals must be shown until the pilot is on board, or until an answering signal has been made.

Vessels arriving at night, but not wishing to enter at night, shall show the pilot signal at daybreak.

Vessels approaching the Palembang light-vessel, and bound for Banju Asin rivier and Ayer Lalang shall show the Code pendant of the International Code of Signals under the pilot signal.

Answering signals by pilot light-vessels.—The following answering signals are given by pilot light-vessels to entering vessels giving the pilot signal :—

Day signal.	*Night signal.*	*Signification.*
Nil.	*White* flare or swinging a *white* light.	The pilot will proceed to the vessel at once.
Flag " D " of the International Code of Signals or a cone, point upwards, surmounted by a ball.	A *red* light above a *white* light.	No pilot is available on board the pilot lightship ; the vessel may enter without a pilot until one is met with.

COMMUNICATIONS.—For Air, Road, Rail and Sea communications, *see* page 4.

Radio stations.—A coastal radio station, open for public correspondence, is established at Tandjung Uban (Tandjunguban in List). For details, *see* list published by the General Secretariat of the International Telecommunication Union.

For details of radio stations which transmit weather bulletins, storm signals, navigational warnings, time signals, etc., *see* Admiralty List of Radio Signals.

Telegraph and telephone services.—The ports, principal towns, and many of the villages of any importance within the area described in this volume, are connected to the general telegraphic and telephonic services.

SHIPPING.—In 1940, 9,836 power vessels, with an aggregate of 10,156,516 registered tons, entered the ports in the Republic of Indonesia.

FUEL.—Coal and fuel oil can be obtained at Palembang; there are no regular coaling stations for large vessels in the area comprised in this volume. Fuel oil and Diesel oil can be obtained at Tandjung Uban. Fuel oil, in barrels, can be obtained at Pangkal Pinang. Vessels partially loaded with fuel oil at Palembang can complete to full cargo at Rede Muntok, *see* page 102.

REPAIRS.—Repairs to the hull and machinery of large vessels cannot be carried out at any of the ports in the area comprised in this volume; the nearest ports at which such repairs can be undertaken are Singapore, Tandjung Priok haven and Sourabaya, for details *see* Malacca Strait Pilot and Eastern Archipelago Pilot, Vol. II.

Repairs to small vessels can be carried out at Palembang.

STANDARD AND SUMMER TIMES.—All information regarding Standard Times and Summer Times will be found in the Admiralty List of Radio Signals, Vol. II.

REGULATIONS.—Zeegats and harbours in the Republic of Indonesia.—Manœuvres or other causes may necessitate the closing of the various zeegats and harbours, or may make the entry thereto subject to special reservations.

In normal cases the following signals will be shown from a flagstaff in the harbour area and/or from a lookout station, or may be shown from the pilot light-vessels:—

Day signal.	*Night signal.*	*Signification.*
A black cone, point up, between two black balls.	A *white* light between two *red* lights.	Entering prohibited.
A black ball below two black cones, points together.	A *white* light, with a *green* light above it and a *red* light below it.	Entering and leaving prohibited.
A black cone, point down, below two black cones, points together.	A *white* light between two *green* lights.	Leaving prohibited.

All the above shapes and lights are disposed vertically.

In exceptional circumstances, three red balls or three *red* lights, disposed vertically, denotes that vessels are absolutely prohibited from entering, except in most urgent cases. When this signal is seen by a vessel approaching she must proceed—wind and sea permitting—to the examination vessel, which displays the same signal, stationed at the entrance to the zeegat.

Permission or refusal to enter will be given after examination. A vessel is then only allowed to enter provided she is in charge of a pilot, or is preceded by a warship or a pilot vessel; from the moment the signals are shown all exemptions from taking a pilot cease. Captains and masters of vessels are to carry out the instructions of the officer who has come on board from the examination vessel and are to obey all signals.

If a warning shot is fired, the engines of all vessels in the vicinity of the examination vessel must be stopped immediately, in so far as safety permits. Failure to comply with these regulations may result in danger to the vessel and crew. As a general rule permission to enter at night will not be granted.

If a signal is made from the shore to intimate that vessels are subject to examination, and if there is no examination vessel in the entrance to the zeegat, vessels must anchor or lie off.

The coming into operation of these regulations at any particular zeegat or harbour will not be announced beforehand.

DERATISATION.—In accordance with Article 28 of the International Sanitary Convention of 21st June, 1926, Deratisation can be carried out, and Deratisation and Deratisation Exemption certificates can be issued at the more important ports in the Republic of Indonesia.

CAUTIONS.—**Submarine vessels.**—British vessels fly the International Code Group HP to denote that submarines, which may be submerged, are in the vicinity. Vessels are cautioned to steer so as to give a wide berth to any vessel displaying such a signal. If from any cause it is necessary to approach her, vessels should proceed at slow speed until warning is given of the danger zone by flags, semaphore or megaphone, etc., a good look-out being kept meanwhile for submarines whose presence may be only indicated by their periscopes showing above water.

A submarine, submerged at too great a depth to show her periscope, may sometimes indicate her position by releasing a smoke candle which gives off a considerable volume of smoke on first reaching the surface. Her position may sometimes be indicated by red-and-white or red-and-yellow buffs or floats, which tow on the surface close astern.

In certain circumstances, warning that submarines are exercising in specified areas may be broadcast by radio.

It must not be inferred from the above that submarines exercise only when in company with escorting vessels.

By virtue of the construction of a submarine the only position from which navigation lights can be exhibited is the Conning Tower of the vessel and this is approximately in the centre of her length.

The single steaming light, bow lights and overtaking light are necessarily low down and closely spaced and give no indication of the submarine's length nor of her exact course or change of course. They may be mistaken for the lights of a very much smaller vessel of the coastal type.

Netherlands submarines.—Netherlands vessels, which are carrying out exercises with submarines or are escorting submerged submarines, display a red flag at the masthead.

All vessels must give a wide berth to the vessel displaying a red flag at the masthead.

A vessel, which for some reason or other finds it necessary to approach the vessel displaying a red flag, must proceed at slow speed until the latter vessel has indicated the danger zone by means of flag or other signals, or by megaphone.

In every case, in these circumstances, a good look-out must be kept for submarines which may have only the periscope above water.

Submarine cables.—The following Articles are taken from the International Convention for the protection of Submarine Telegraph cables, of 14th March, 1884.

II. It is a punishable offence to break or injure a submarine cable, wilfully or by culpable negligence, in such manner as might interrupt or obstruct telegraphic communication, either wholly or partially, such punishment being without prejudice to any civil action for damages.

This provision does not apply to cases where those who break or injure a cable do so with the lawful object of saving their lives or their ship, after they have taken every necessary precaution to avoid so breaking or injuring the cable.

V. Vessels engaged in laying or repairing submarine cables shall conform to the regulations as to signals which have been, or may be, adopted by mutual agreement among the High Contracting Parties, with a view of preventing collisions at sea.

When a ship engaged in repairing a cable exhibits the said signals, other vessels which see them, or are able to see them, shall withdraw to or keep beyond a distance of one nautical mile at least from the ship in question, so as not to interfere with her operations.

Fishing gear and nets shall be kept at the same distance.

Nevertheless, fishing-vessels which see, or are able to see, a telegraph-ship exhibiting the said signals, shall be allowed a period of twenty-four hours at most within which to obey the notice so given, during which time they shall not be interfered with in any way.

The operations of the telegraph-ships shall be completed as quickly as possible.

VI. Vessels which see, or are able to see, the buoys showing the position of a cable when the latter is being laid, is out of order, or is broken, shall keep beyond a distance of one-quarter of a nautical mile at least from the said buoys.

Fishing nets and gear shall be kept at the same distance.

VII. Owners of ships or vessels who can prove that they have sacrificed an anchor, a net, or other fishing gear in order to avoid injuring a submarine cable, shall receive compensation from the owner of the cable.

In order to establish a claim to such compensation, a statement supported by the evidence of the crew, should, whenever possible, be drawn immediately after the occurrence; and the master must, within twenty-four hours after his return to or next putting into port, make a declaration to the proper authorities.

The latter shall communicate the information to the Consular authorities of the country to which the owner of the cable belongs.

Caution.—Cautionary notes appear on many charts, calling attention to areas in which there are submarine telegraph cables; these areas are indicated on the charts by pecked lines.

Every care should be taken to avoid anchoring in such areas, even though there may be no specific prohibition against doing so, in view of the serious interference with communications which results from damage to submarine cables.

Equal care should be taken wherever the symbol for a submarine cable (a wavy line) is shown on the chart.

Danger involved in cutting a submarine cable to clear anchors or fishing gear.—In the event of any vessel fouling a submarine cable, every effort should be made to clear the anchor or gear by normal methods; should these efforts fail, the anchor or gear should be slipped and abandoned *without attempting to cut the cable. High voltages are, or may be, fed into certain submarine cables; serious risk exists of loss of life due to electric shock, or at least of severe burns if any* *attempt to cut the cable is made.* No claim in respect to injury or damage sustained through such interference with a submarine cable will be entertained.

Compensation for anchors or fishing gear sacrificed in order to avoid injuring a submarine cable can be claimed under the Submarine Telegraph Act of 1885 (Schedule of Submarine Telegraph Convention, Article VII).

Air lights.—Mariners are warned that lights (with definite characteristics), which are not ordinary navigational aids, may be exhibited for the use of aircraft from structures near the coasts described in this volume.

The lights are often of great luminous power and elevation, and may be the first lights or looms of lights sighted when making a landfall at night; they normally have the following characteristics:—

(*a*) *Flashing white* (revolving beam type).
(These lights are usually screened from seaward, but their looms may be visible).

or (*b*) *Alternating flashing white and green* (revolving beam type).

or (*c*) *Flashing two letter groups* in the Morse Code, in *red* or *green.*
(Although the groups made by these lights may have definite meanings in the International Code of Signals, their signification is to be disregarded; the fact that they are *red* or *green* in colour, and flash with mechanical regularity, should prevent their being mistaken for signals from shore signal stations or ships).

Air lights which appear likely to be visible from seaward will be shown on charts and described in the Admiralty Lists of Lights. As they are subject to changes of which prompt notification to the mariner may not always be possible, care should be taken that they are not confused with marine navigational aids.

Fishing stakes.—On some of the outlying banks and off many parts of the coasts mentioned in this volume, particularly off the mouths of rivers, fishing stakes and enclosures will be met in depths of from 3 to 5 fathoms ($5^{m}5$ to $9^{m}1$), and in some cases in greater depths. These enclosures, known as *seros* and *jermals*, are constructed of trees firmly driven into the banks, and interlaced with branches, etc., and form a considerable danger to vessels navigating at night near the depths mentioned. They last many years, and to those with local knowledge are good landmarks for making the river mouths, especially on the east coast of Sumatra, where there are but few conspicuous objects.

GENERAL DIRECTIONS.—For Ocean Passages to and from the Eastern Archipelago the mariner is referred to the Admiralty publication "Ocean Passages for the World." Directions for the various straits and passages leading from Sunda strait to Singapore strait or the China sea are given in their appropriate places in the body of this work; a brief account of the through tracts usually taken by vessels on these routes is given hereafter.

From Sunda strait to Singapore.—*Power vessels.*—The shortest route for vessels proceeding from Sunda strait (page 53), or from Tandjung Priok, to Singapore is through Straat Banka (page 90), Straat Berhala (page 231) and Straat Durian (page 252). Power vessels, however, instead of passing through Straat Durian often proceed through Straat Abang (page 227) and thence through Straat Riouw (page 198); or they can pass eastward of Lingga archipel and thence through Straat Riouw. The various routes in this part of the passage are fully described in Chapter VIII.

Low-powered vessels.—Low-powered vessels proceeding northward in December, January and February will find that the route westward of Lingga archipel is preferable to that eastward of it; westward of these islands the sea is calmer. Instead of proceeding through Straat Durian many low-powered vessels prefer the route through Straat Abang and Straat Riouw, so as to avoid the western part of Singapore strait, where they may be considerably delayed by strong winds and anchoring is difficult owing to the great depths. Straat Bulan (page 273) is sometimes used by low-powered vessels wishing to avoid the bad conditions likely to be experienced in the eastern part of Singapore strait with strong north-easterly winds.

Low-powered vessels can also use Macclesfield straat (page 121) during the north-west monsoon and Stolze straat (page 126) during the south-east monsoon, the currents thus being less unfavourable; the former provides better opportunity for anchoring and there is calmer water during the north-west monsoon. Stolze straat is, however, the safer channel, being the broadest and having no dangers in the fairway. With thick weather Gaspar straten, which includes the above two straits, are difficult and dangerous to make, and Straat Banka is preferable under such conditions.

From Sunda strait to the China sea.—*Power vessels.*—The customary route for power vessels proceeding to the China sea from Sunda strait or Tandjung Priok is through Stolze straat and thence eastward of the Pengiki eilanden (*see* China Sea Pilot, Vol. II).

Low-powered vessels.—From April to September low-powered vessels follow the same route northward as for power vessels, although with rainy weather or bad visibility it is better to go through Straat Banka; during the remainder of the year the route eastward of Borneo, through Straat Makasser (*see* Eastern Archipelago Pilot, Vol. II), is generally taken.

Low-powered vessels bound southward from the China sea from October to February follow the route previously given for power vessels in the reverse order. In March, April and the first part of May they proceed through Api passage (*see* China Sea Pilot, Vol. II), through Straat Karimata (page 164) and thence to Noordwachter.

From East Java to Singapore.—*Power vessels.*—Power vessels bound for Singapore from East Java usually proceed through Straat Karimata and Straat Riouw.

Low-powered vessels.—Low-powered vessels follow the same route as power vessels. Vessels passing through Straat Karimata should hold the Borneo coast in both monsoons and follow the Inner route (page 178), eastward of the Lajah eilanden, as it is nearly impossible to pass through the main channel westward of Serutu; there is a strong current here caused by the prevailing monsoon.

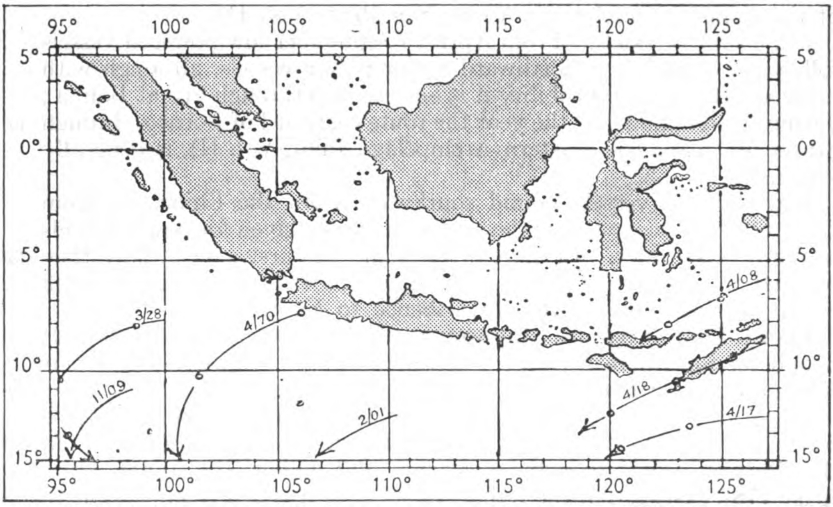
CLIMATE AND WEATHER.—Two wind systems are prominent over the open sea in the area covered by this volume, the south-easterly trade wind (known locally as a monsoon) and the north-westerly monsoon. Northward of about Lat. 10° S. the main season of the trade wind is from May to September and that of the north-westerly monsoon from mid-December to March; southward of Lat. 10° S. the trade wind season is longer and in the vicinity of the Cocos islands lasts the whole year. The trade wind often blows strongly and sometimes maintains a moderate gale (Beaufort force 7) for 24 hours or longer southward and south-westward of Sunda strait. The north-westerly monsoon is normally light but brings violent squalls from time to time.

Fog is almost unknown at sea. It sometimes forms at night on the coast, but generally clears soon after sunrise. During the trade wind season, normally visibility is good at sea but when the trade wind season is unusually dry sometimes there is considerable haze both at sea and on the coast. During the north-westerly monsoon however the air is generally very clear when rain is not falling, and mountain peaks are sometimes visible a hundred miles away.

Over most of this area temperature averages 80° F. or more in all months, but the effect of the heat is alleviated by the trade wind, and on the coast also by sea breezes. There are, however, periods of enervating damp heat, mostly in the intervals between the trade wind and the monsoon.

Except where mountains afford shelter from the north-westerly monsoon, which brings most of the rain, nearly all parts of this area have an annual rainfall several times as great as that of south-east England; on the western coasts of Java and Borneo for example there are places where the yearly fall exceeds 120 inches.

Tropical revolving storms (*see* standard article, page xxxv, and figure on this page) occasionally cross some parts of the area which lies southward of about Lat. 4° S., but in July and August the possibility of this happening is negligible.



Some tracks of cyclones.

Pressure.—Mean monthly and annual pressures for four land stations within the area covered by this volume and for Djakarta and Pontianak are included in the climatic tables on pages 36 to 41, and the average distribution of pressure in January and July is indicated by the isobars in Figures 1 and 2 on pages 23 and 24.

In this tropical region, remote from the main systems of high and low pressure, the barometer is mostly within a few millibars of 1010 mb. Day to day variations are generally small, and very high or very low readings are rarely encountered. The highest pressures are likely to occur in the extreme south-west, between August and October, on

Fig. 1.

JANUARY, MEAN PRESSURE

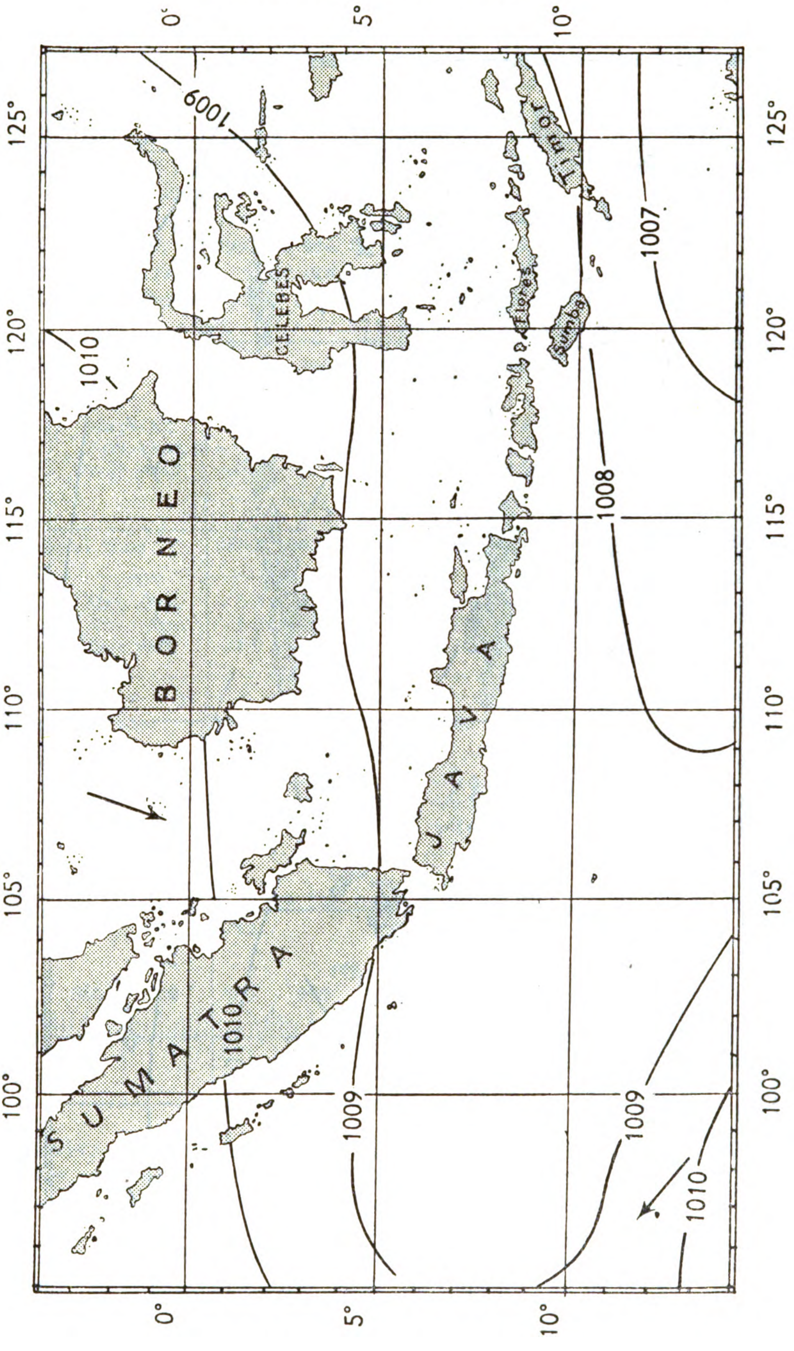
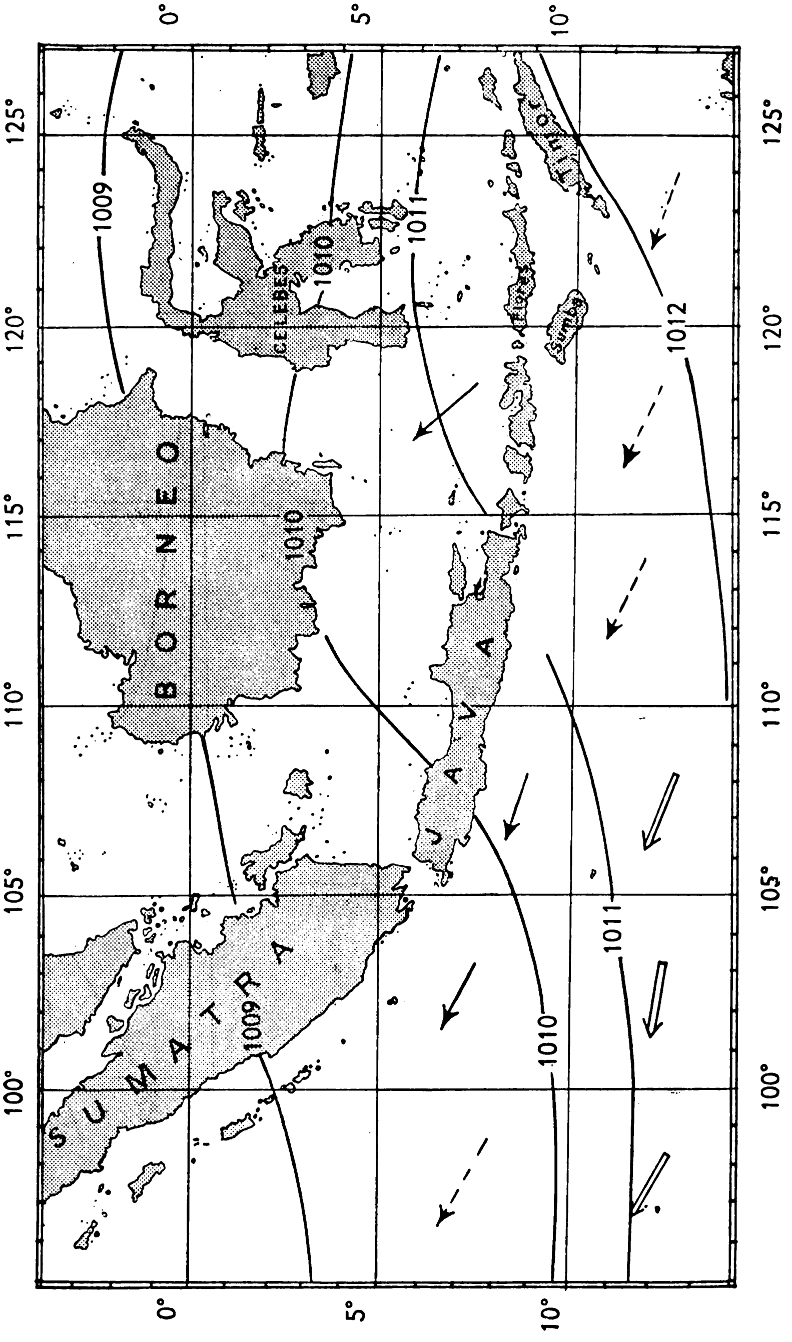


Fig. 2.

JULY, MEAN PRESSURE



occasions when the high pressure system between Australia and South Africa is unusually well developed or lies northward of its normal position. Very low pressures are more likely to be found southward of about Lat. 3° S. than in other parts of the area, especially from about November to March, since tropical revolving storms (*see* standard article, page xxxvi), although rare, are more likely to occur in those months than in others.

There is a fairly regular diurnal variation of pressure, of the type characteristic of the tropics. It has a range of about 3 mb. Pressure is on an average highest at about 1000 and 2200, and lowest at about 0400 and 1600 local time.

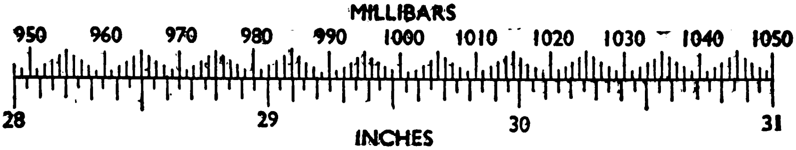
The table below gives, for each hour, the corrections in millibars which should be applied at sea to the observed pressure to allow for the diurnal variation. The corrections for 0–10° S. can also be used for the region between 10° S. and the southern limits of the area.

Local time		0	0100	0200	0300	0400	0500	0600	0700
0–10° N.	May–Oct.	−0·7	−0·2	+0·2	+0·6	+0·7	+0·5	+0·1	−0·4
	Nov.–Apr.	−0·6	−0·1	+0·5	+0·8	+0·9	+0·7	+0·2	−0·4
0–10° S. whole year		−0·7	−0·2	+0·2	+0·6	+0·7	+0·5	+0·1	−0·5

Local time		0800	0900	1000	1100	1200	1300	1400	1500
0–10° N.	May–Oct.	−0·9	−1·2	−1·3	−1·0	−0·5	+0·2	+0·8	+1·3
	Nov.–Apr.	−1·0	−1·4	−1·5	−1·2	−0·7	+0·1	+0·8	+1·4
0–10° S. whole year		−1·0	−1·3	−1·3	−1·1	−0·5	+0·2	+0·9	+1·4

Local time		1600	1700	1800	1900	2000	2100	2200	2300
0–10° N.	May–Oct.	+1·5	+1·4	+1·0	+0·4	−0·2	−0·7	−1·0	−0·9
	Nov.–Apr.	+1·6	+1·5	+1·0	+0·4	−0·3	−0·8	−1·0	−1·0
0–10° S. whole year		+1·6	+1·5	+1·1	+0·5	−0·1	−0·7	−0·9	−0·9

The diagram below gives the equivalent, in millibars, of inches of mercury and vice versa.



Winds.—The two main wind systems that affect the area covered by this volume (the south-east trade wind and the north-westerly monsoon) are briefly described under "Climate and Weather" on page 21. The former is part of the trade wind belt of the southern hemisphere. It turns northward in August and September and after crossing the equator merges into the south-west monsoon of the China sea.

At sea there are regions where land and sea breezes (*see* "Local modification of the weather near the coast," page xlvii) resulting from the diurnal variation of temperature over far distant Java, Borneo or

Sumatra are too weak to modify the directions of the two main wind systems. In such regions the two air streams are deviated appreciably by the trend of the nearest coastlines. For example, in the southern approaches to Sunda strait, with the nearest land at least three hundred miles away, a weak trade wind may be drawn towards the entrance to that strait. Similarly, in the Java sea, not only the south-east trade wind but the north-westerly monsoon may be drawn towards Sunda strait and in both cases the wind tends to blow from a north-easterly or northerly direction. In consequence it may sometimes be impossible in such a region to know for certain whether the south-east trade wind or the north-westerly monsoon is blowing.

In this and earlier sections the two main wind systems have been called the south-east trade wind and the north-westerly monsoon, but to European residents and native population both are usually known as monsoons; where the north-westerly monsoon blows more from a northerly direction it is known locally as the "northerly monsoon," and where the south-east trade wind becomes southerly, as happens near the equator, it is known as the "southerly monsoon."

Gales.—At sea southward and south-eastward of Sunda strait, there are generally one or two moderate gales (Beaufort force 7) per month from July to September, the months when the south-east trade wind is normally strongest (Figure 4 shows the average frequency of winds of force 7 or more in July). From December or January to March there are very few gales apart from the squalls that occur from time to time during the north-westerly monsoon. These rarely last very long, but may reach Beaufort force 8 or 9. The most severe gales are those associated with tropical revolving storms, but these storms are rare. On the coast gale frequency is very dependent upon the degree of sheltering, especially sheltering from the south-east trade wind since the sea breeze (*see* "Local modification of the weather near the coast," page xlvii) may, in exposed places, cause a local gale during the hottest part of the day while at sea the trade wind is only fresh to strong (Beaufort forces 5 to 6).

Tropical revolving storms.—These storms may be very destructive, but many years normally elapse between extreme cases. They are described in the standard article on page xxxvi and typical tracks are shown in the figure on page 22.

In the area covered by this volume the main danger zone is between about latitudes 10° S. and 13° S.; the western end of the Java sea is too far from normal storm tracks to be affected, except on very rare occasions and then as a rule only in the vicinity of Sunda strait. Most storms occur between about November and April; July and August are virtually immune.

Regional winds.—(*a*) **Cocos or Keeling islands.**—These islands seldom experience any wind other than the trade wind, which blows from south-easterly and easterly directions.

At sea from one third to one half of all winds are fresh or strong (Beaufort force 5 or 6) from May to October and about one fifth from January to March. The number of days with a steady gale reaches an average of one a month from July to September but is much less from January to March, during which period a few of the gales are from between west and north. In all months of the year there are brief squalls of gale force but very few calms.

There always exists the possibility of a tropical revolving storm (*see* standard article, page xxxvi, and figure on page 22). In any one of the months November to April, the period of the greatest risk, it is

Fig. 3.

JANUARY PERCENTAGE FREQUENCY OF WIND, FORCES 7–12

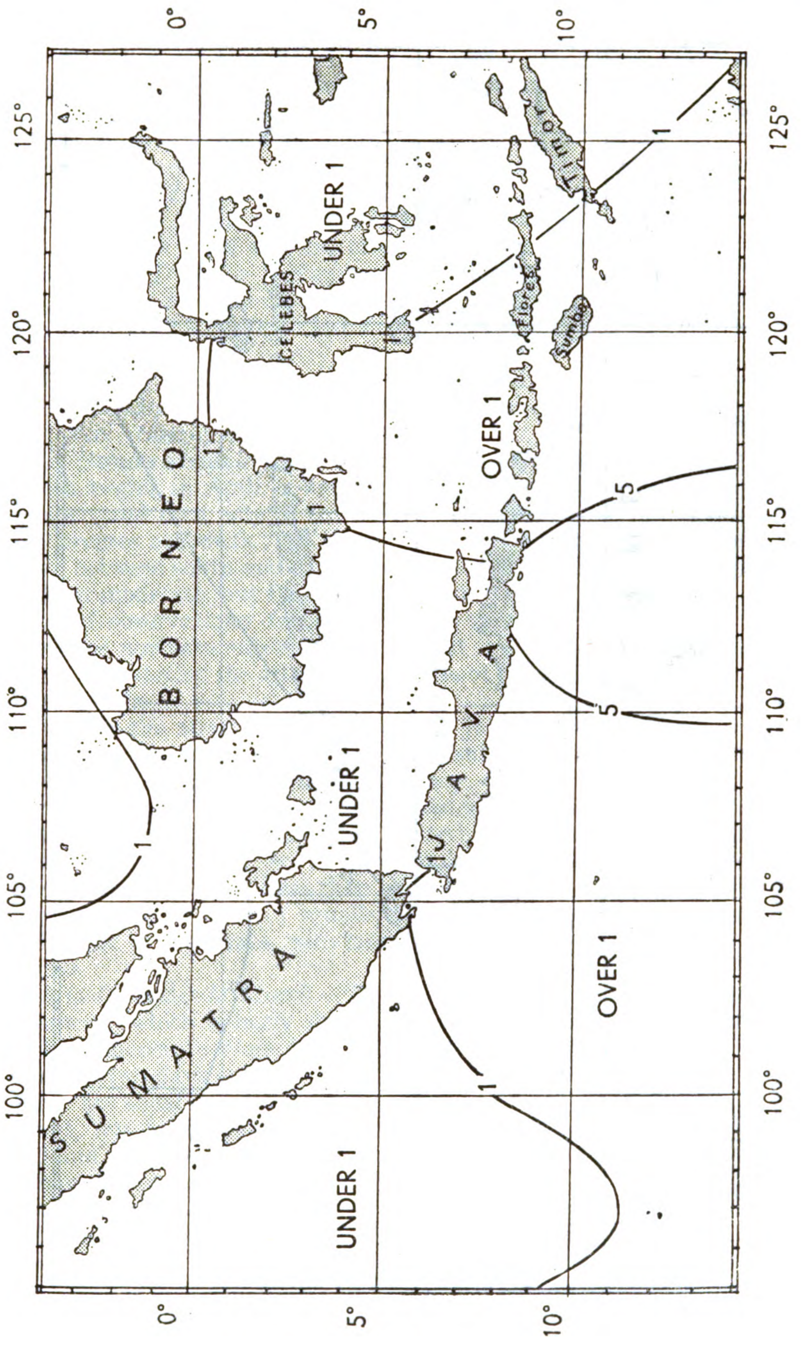
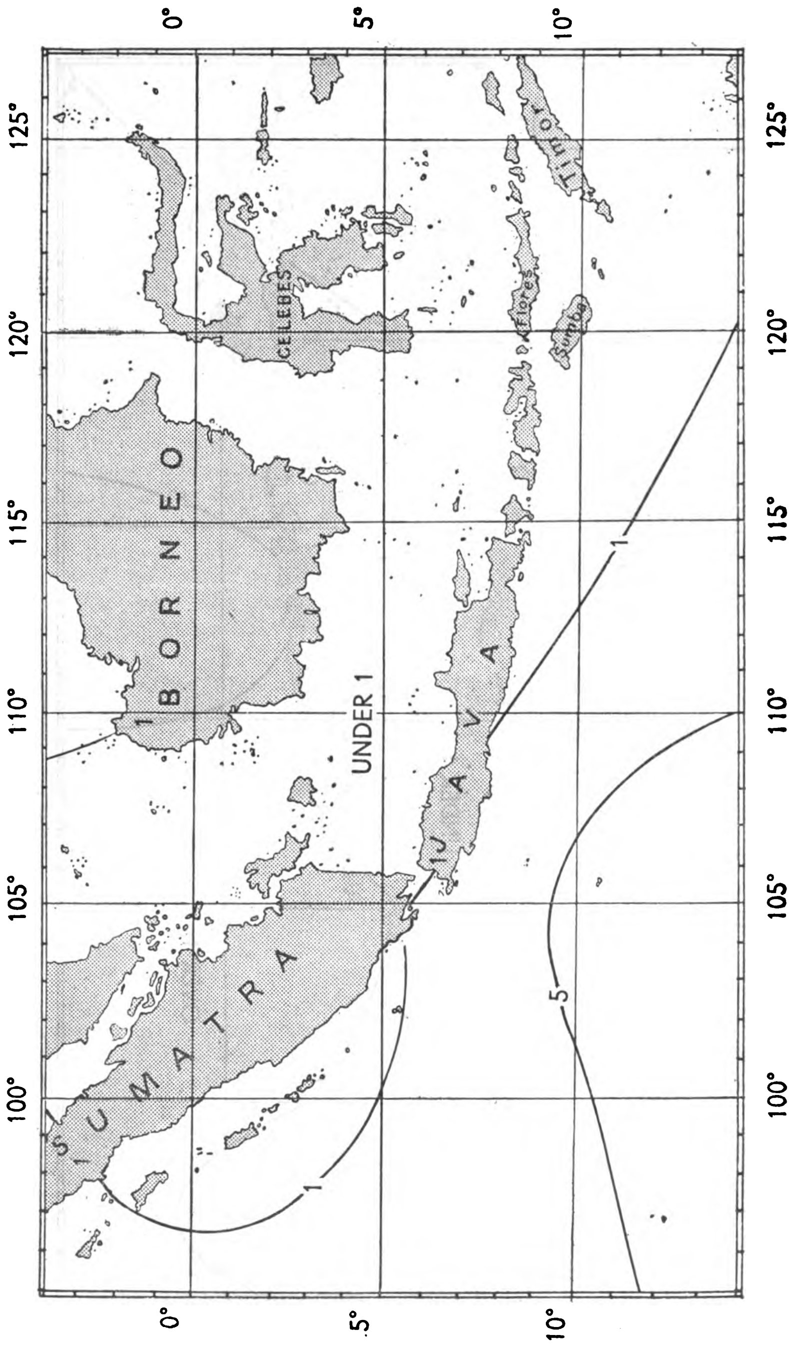


Fig. 4.

JULY PERCENTAGE FREQUENCY OF WIND, FORCES 7–12



estimated that there is on an average a destructive storm once every 30 or 40 years. When the storm of November 27th, 1909, crossed the group, the barometer fell to 945 mb. and in six hours the wind and waves levelled all villages and left practically nothing standing.

(*b*) **Christmas island.**—On the island the wind is much influenced by topographical effects (*see* " Local modification of the weather near the coast," page xlvii), and for this reason the figures given in the climatic table on page 37 are not representative of winds in coastal waters or out at sea.

Ten miles or more from land the winds are as follows :—

January to March.—Mainly westerly, and light to moderate, but strong in squalls (one or two squalls of force 7 to 9 in a month). Squalls are generally from a north-westerly or northerly direction. They raise an unpleasant sea and often make landing impracticable.

April to December.—Mainly south-easterly to easterly, light to moderate on 20 to 30 days in a month, fresh to strong on 2 to 5 days. There are generally one or two moderate gales in a month from July to September.

No severe cyclone has crossed the island since a settlement was founded in 1888, but the possibility of one doing so, between September and May, cannot entirely be set aside.

(*c*) **Sunda strait.**—*April to September.*—The south-east trade wind which begins in April is not very steady except in August and September, and then only in the wider parts of the strait where land and sea breezes are weak ; in these latter circumstances most winds are from between south and east ; more often than not the winds are only light or moderate, but Beaufort force 5 or 6 has been recorded in 20 per cent of observations during these two months.

At the northern entrance to the strait the wind often backs towards north-east during the afternoon because of the sea breezes on the north coast of Java.

Within the strait near the coast of Java the land breeze at night reinforces the trade wind, with the result that the wind is generally stronger at night than during the day.

October to mid-December.—South-easterly winds tend to give way to south-south-westerly and south-westerly winds during October, and from mid-November to mid-December south-westerly to westerly winds predominate. Less than once a month on an average the wind reaches force 8 or 9 in squalls, but during most of the 2½ months it is light or moderate, with land and sea breezes prominent near the coasts.

Mid-December to March.—This is the season of the north-westerly monsoon, which is fairly steady in the wider parts of the strait, with light to moderate winds from between west-south-west and west-north-west on two days out of three. Less than once a month on an average there are squalls of force 8 or 9 ; they are mainly from some westerly point, but in February are more often north-westerly or northerly.

Land and sea breezes are prominent near the coasts except during prolonged periods of cloud and rain.

(*d*) **South-eastern coast of Sumatra.**—*November to April.*—In November, over the open sea, the trade wind continues so that south-easterly winds out-number winds from any other one quadrant, but the approach of the season for the north-westerly monsoon is shown by an increase in the number of south-westerly and north-westerly winds. Most winds are light, but a few typical trade wind squalls usually occur.

From December to March, over the open sea, the north-westerly monsoon is normally well established, especially in January and February. In these two months most winds at sea are from between west and north, but it is unusual for the wind to be more than light to moderate.

In April, over the open sea, winds are mainly light and do not favour any particular direction.

In coastal waters throughout the six months land and sea breezes are prominent, causing the north-westerly monsoon to become westerly and the south-east trade to become easterly. Violent squalls, and also periods of several hours duration of fresh to strong wind, are both more common near the coast than over the open sea.

May to October.—In May, over the open sea, the south-east trade wind is fairly well established, half of all winds being from between south and east; at the height of the monsoon in August the proportion is at least three-quarters, and it is not until October that it falls below one half. Even in August few only of all winds experienced are more than moderate in strength, and throughout the trade wind season light winds are the most frequent.

In coastal waters land and sea breezes are prominent, and where the lie of the land favours the development of the sea breeze during the warmest part of the day, the trade wind and sea breeze combine to give Beaufort force 5 or 6 for several hours on end, while in extreme cases the wind may reach a moderate gale (force 7).

Both at sea and on the coast typical trade wind squalls occur from time to time, and may exceptionally reach force 8 or even 9.

(*e*) **Straat Banka.**—The north-westerly monsoon is steadiest from November to March. As regards strength it is similar to the north-westerly monsoon near the south-east coast of Sumatra (*see* previous section), but as regards direction there is a larger proportion of winds from about north-west, in this area, than off southern Sumatra, since these winds follow the run of the strait.

The south-east trade wind, or southerly monsoon, comes in the same season as does the trade wind near the south-east coast of Sumatra, but is nearly always light and blows mainly from between south-east and south-west.

Land and sea breezes are prominent in fine weather and violent but infrequent squalls may occur in any month, even during the height of the trade wind season.

(*f*) **Palembang.**—The north-westerly monsoon has a relatively short season. It is fairly steady from December to February, but is less steady in March. By April northerly to north-easterly winds are the most frequent. North-easterly winds are predominant in May and June, and south-easterlies from July to October. In November south-westerly winds are more frequent than winds from other directions.

Land and sea breezes are often prominent, and occasional violent squalls occur.

(*g*) **Straat Karimata and Gaspar straten.**—In November and December winds are mainly westerly; from January to March north-westerly, becoming variable in April. From May to September the trade wind blows fairly steadily from between south and east, but the wind again becomes variable in October, in which month the north-westerly monsoon normally begins with its characteristic violent westerly squalls and fine intervals. Waterspouts have sometimes been observed during disturbed periods in the north-westerly monsoon.

On the islands of Banka and Billiton there are weak land and sea breezes that are yet strong enough to deviate both the trade wind and the north-westerly monsoon near the coast.

On the western coast of Borneo the land and sea breezes are more pronounced, and both the seasonal air streams are greatly affected by them. At Sukadana the north-westerly winds are almost always deviated towards west by day and towards north-east at night. In the trade wind season a weak westerly sea breeze blows during the warmest hours of the day, and there is a stronger wind from eastward during the night.

In the northern parts of these two straits a considerable sea sometimes runs during the squally periods of the north-westerly monsoon, and on the northern and north-eastern coasts of Banka, where the monsoon blows mainly from northerly directions, there is considerable swell at times. Over the region of the straits generally, there is usually more swell in January and February than in any of the months during which the trade wind is predominant.

(*h*) **Riouw and Lingga archipels.**—November to March is the season for the north-westerly or northerly monsoon (wind direction varying between north-west and north-east), and this monsoon is most firmly established in January and February.

From May to September, which is the main season for the trade wind, or southerly monsoon, the most frequent winds are those from about south and south-east, but there is less constancy of direction than for the northerlies of January and February.

In no season are land and sea breezes very prominent. The occurrence of infrequent but sometimes very strong squalls from westward is characteristic of this region, and such squalls may occur in any month ; they are usually associated with thunderstorms, and the wind is often light southerly or south-easterly before the squall. Such squalls generally occur in the evening or early part of the night.

Cloud.—The cloud amount over most of the area described in this volume is considerable except near Christmas island and the Cocos islands. Averages for these islands of the number of clear and cloudy days per month are included in the climatic tables on pages 36 and 37. In most coastal regions there is more cloud with the north-westerly monsoon than with the south-east trade wind (or southerly monsoon) but much depends upon the degree of sheltering by mountain ranges. Over the open waters of Straat Karimata and Gaspar straten cloudy skies are very common during both monsoons. At sea in the extreme northern part of Riouw and Lingga archipels there is little seasonal variation of the amount of cloud except in the eastern parts of those archipelagos where there is a minimum of cloud in August and September.

During the north-westerly monsoon the commonest types of cloud are cumulus and cumulo-nimbus. Over the land both forms are more in evidence in the afternoon and evening than during the night and early morning. In the early morning it is often cloudless. At sea the clouds tend to accumulate during the night and to clear during the day.

During the south-east trade wind (or southerly monsoon) there are fewer cumulo-nimbus clouds, but ordinary cumulus clouds are prevalent over the land during the warmest hours of the day, except when the weather is unusually dry.

Rainfall.—An indication of the distribution of rainfall over the area is given near the end of the opening section on Climate and Weather. More detailed information may be found in the climatic tables on pages 36 to 41, which include monthly and yearly averages of rainfall for several places within the area, and for Djakarta. Averages are, however, little guide to the rain that is likely to fall in a particular month in any one year, since large fluctuations resulting from variations of wind occur from one year to another. Even in one of the transitional months with high average rainfall there may in some years be little or none. In most regions not affected by mountains (*see* " Local modifications of the weather near the coast," page xlvii), very heavy and prolonged rainfall is almost certain, however, to occur in December and January, while in August and September there will probably be few days with more than 0·04 in. of rain.

At the Cocos islands there is no dry season, but from August to December the average monthly rainfall decreases to about 4 inches, which is half the monthly average for the rest of the year. At Christmas island there is even less seasonal variation.

Much of the rainfall in all regions falls in thunderstorms that develop in the afternoon over the land and drift out to sea during the night. Thunderstorms, moreover, are frequent during the periods of continuous heavy rain, lasting for two or three days and which are common with the north-westerly (or northerly) monsoon, as well as in the transitional periods.

Visibility.—During the rainiest months, visibility is normally very good when rain is not actually falling, but while rain is falling it is often poor. In very heavy downpours and thunderstorms with squalls, visibility may even be reduced to half a cable or less ; such a combination of high wind and heavy rain is, however, very unusual. Periods of exceptionally good visibility, on the other hand, are particularly noticeable towards the end of a wet season, when, with diminished cloudiness, the outlines of distant mountains are sharply defined.

At all times of the year fog or mist may form at night over the land, especially over low-lying wet ground, but usually disappears soon after sunrise. Fog very rarely, if ever, forms at sea.

During the season of the south-east trade wind (or southerly monsoon) there is much haze, especially in the driest parts of the region ; the outlines of the mountains become indistinct and the blue of the sky becomes a hazy white. The haziness tends to increase as the season progresses and the monsoon increases in strength. Least haze occurs in the middle of the day.

In Straat Banka, Gaspar straten and Straat Karimata, and off the south-eastern coast of Sumatra, the haze sometimes thickens to a grey mist which becomes denser as the wind increases in strength. It is known locally as " Tongara Putih " or " white south-easter."

In Gaspar straten and Straat Karimata weather is sometimes hazy during the north-west monsoon with a fresh northerly wind.

In Sunda strait, there is much hazy weather between May and November, the haze usually being densest in the morning. Near some coasts visibility is often poor in the morning on account of smoke, which drifts seawards with the land breeze.

In Riouw and Lingga archipels, and towards the equator, where this season has more rain than further south, visibility is usually good except in particularly dry seasons.

In the very dry seasons of 1902 and 1914, haze, described as " dense," persisted in some regions from the middle of August until the middle of October ; it was finally dispersed by the November rains. At the same time in Gaspar straten and Straat Karimata visibility was sometimes less than 3½ cables in the daytime, and local rain reduced this haze only for a short time.

Temperature and humidity.—*Temperature.*—Air temperature over most of this area averages about 80° F. in all months and as a rule the difference between the day and night is one of a few degrees only. In fine weather the temperature often rises quickly for an hour or two after sunrise, but increasing cloudiness or the onset of the sea breeze normally checks this rise, and there is no part of the area where temperatures above 95° F. are at all frequent. The temperature of the sea generally equals that of the air or is slightly the higher of the two (*see* Figures 5 and 6 on pages 34 and 35).

Humidity.—The air is nearly always damp, and this often makes the heat sultry and oppressive. This is especially the case before the break of heavy showers and thunderstorms that are so frequent during the wet season and also at almost any time when the breeze fails. Since there are fewer windless periods at the Cocos islands and Christmas island than in most parts of the area further north, those islands get slightly less enervating weather.

Climatic tables.—The tables on pages 36-41 give statistics for several land stations at which there is a regularly reporting weather station. The figures given are averages, percentage frequencies or extremes, as stated ; it must be realised that these values refer to the actual positions in which the weather has been observed, and *not* necessarily to the open sea or to the approaches to ports in the vicinity. The tables for land stations should therefore be consulted with discretion, especially as regards wind, visibility, cloud, temperature and humidity, since all these elements are affected, some a great deal, by local conditions. The following notes indicate ways in which conditions over the open sea may differ from those at the nearest reporting station for which a table is published.

(1) Temperature over the sea is less variable than over the land; for example the nights are generally warmer at sea, and the days cooler, than over the land.

(2) Rainfall at most coast stations in this area is affected by neighbouring mountains, and the influence of the mountains generally decreases over the open sea with increasing distance from the land.

(3) The frequency of cloudy days on the coast often differs widely from the frequency a few miles out at sea, and similarly for clear days (*see* section on Cloud, page 31).

(4) Wind speed is generally greater at sea than on the coast, and there may be twice as many gales at sea than at the nearest shore stations, but such a difference would not exist if the shore stations were in open positions on headlands or on low lying islands devoid of shelter. Wind direction may also be greatly affected (*see* " Local modifications of the weather near the coast," page xlvii).

(5) Fog sometimes forms on the coast, but very rarely, if ever, develops at sea (*see* section on Visibility, page 32).

Fig. 5.

FEBRUARY, MEAN SEA SURFACE TEMPERATURE

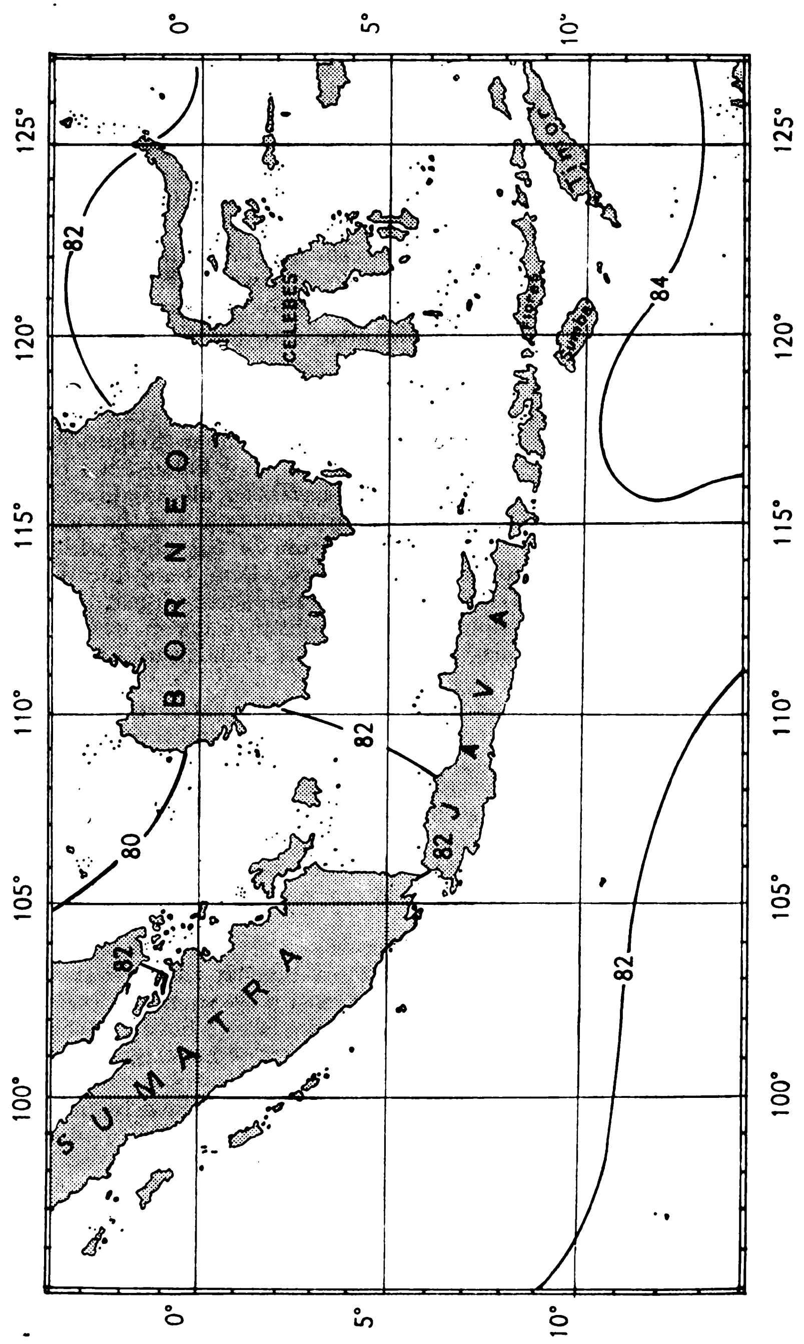
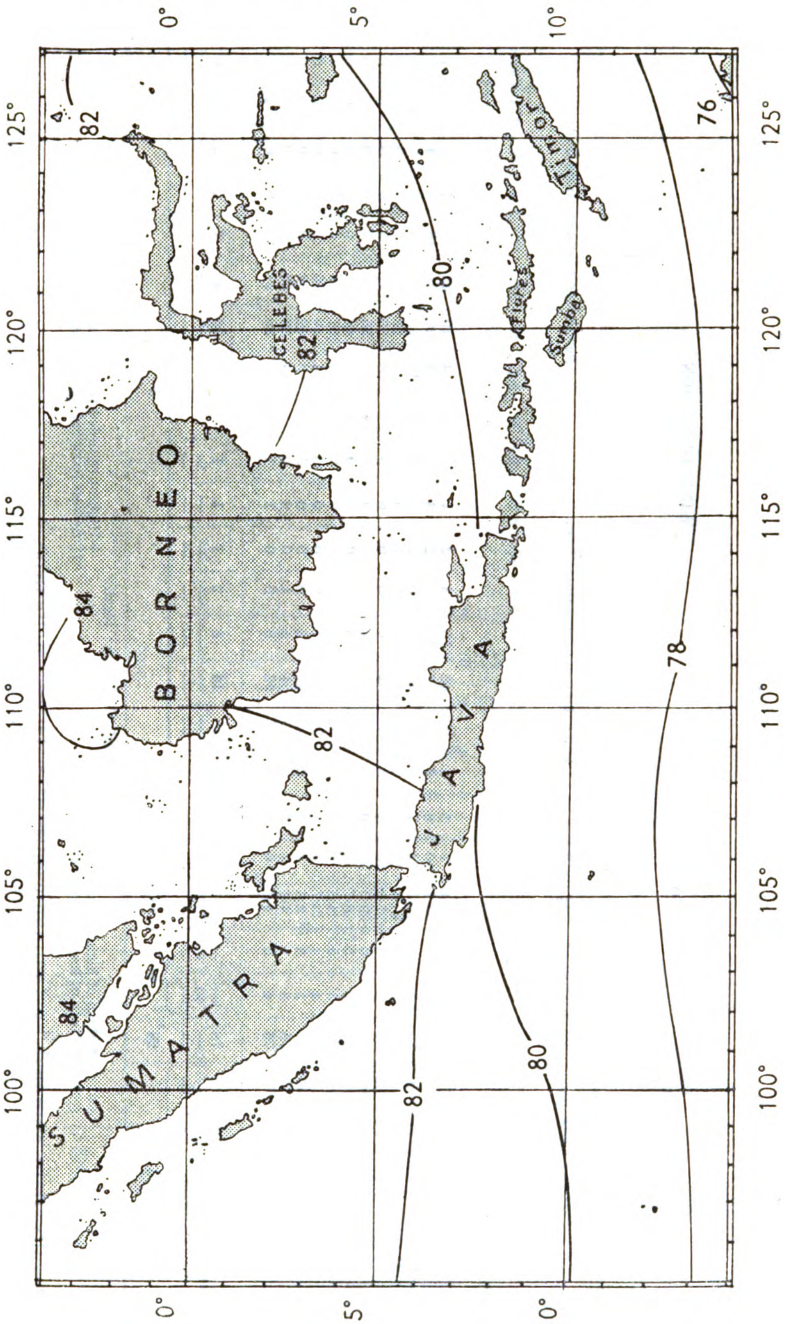


Fig. 6.

AUGUST, MEAN SEA SURFACE TEMPERATURE



PLACE—COCOS ISLAND. LAT. 12° 05′ S., LONG. 96° 53′ E. Height above Mean Sea Level, 15 feet.

Climatic Table compiled from 5 to 38 Years' Observations, 1905 to 1942.

MONTH	PRES-SURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		SKY No. of days		RAIN	
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in each month	0900	1500	Clear: less than 2 oktas	Cloudy: more than 6 oktas	Average fall	No. of days with 0·1 in. or more
	mb.	° F.	° F.	° F.	° F.	%	%			in.	
January	1011	86	77	90	73	76	74	5	5	5·4	7
February	1010	87	77	90	73	79	77	2	5	7·7	10
March	1010	86	78	90	74	80	78	4	7	8·5	12
April	1011	85	78	88	74	82	80	2	6	10·4	11
May	1012	84	77	88	74	82	81	3	6	7·9	10
June	1012	83	76	86	73	83	81	3	6	9·0	10
July	1013	82	76	86	72	82	80	4	5	8·7	9
August	1013	83	75	86	72	80	78	3	5	4·8	8
September	1014	83	75	86	72	78	75	4	4	3·7	4
October	1014	84	76	87	72	77	76	3	3	3·3	4
November	1013	85	76	88	73	77	75	3	5	4·2	7
December	1011	85	77	89	73	77	76	4	5	4·6	6
Means	1012	85	76	91*	70**	79	78	—	—	—	—
Totals	—	—	—	—	—	—	—	40	62	78·2	98
Extreme values	—	—	—	94†	68††	—	—	—	—	—	—
No. of years' observations	26	36					28	10		38	10

MONTH	WIND DIRECTION																		Mean wind speed		No. of days with wind speed 28 knots or more	No. of days with fog or mist
	0900									1500									0900	1500		
	Percentage of observations from									Percentage of observations from												
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	knots	knots		
January	3	4	22	42	18	3	2	4	2	4	4	19	43	18	4	1	6	1	5	5	0·2	—
February	6	2	20	37	17	10	2	3	3	6	4	22	31	18	8	4	7	0	5	6	0·2	—
March	7	9	38	32	2	5	2	5	0	8	10	29	30	5	5	3	10	0	6	5	0·5	—
April	1	5	40	45	7	1	1	0	0	0	4	37	49	7	2	0	1	0	7	7	0·5	—
May	1	3	36	54	6	0	0	0	0	1	8	35	51	5	0	0	0	0	9	8	1	—
June	0	1	38	57	4	0	0	0	0	0	3	35	57	4	0	0	1	0	10	9	1	—
July	2	1	42	49	5	0	0	1	0	1	2	40	52	5	0	0	0	0	10	10	1	—
August	1	3	51	42	3	0	0	0	0	1	3	51	39	4	1	0	1	0	9	9	0·5	—
September	1	1	52	45	1	0	0	0	0	1	4	46	46	3	0	0	0	0	9	10	0·3	—
October	1	3	46	47	3	0	0	0	0	0	3	42	52	3	0	0	0	0	8	9	0·2	—
November	1	3	39	51	5	1	0	0	0	1	4	39	52	1	1	0	1	1	7	7	0·2	—
December	5	2	31	52	8	0	0	1	1	5	3	29	57	5	0	0	1	0	7	7	0·3	—
Means	2	3	38	46	6	2	1	1	1	2	4	35	47	7	2	1	2	0	8	8	—	—
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	—
Extreme values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	5																				26	—

Standard of time: local.

* Mean of highest each year.
** Mean of lowest each year.

† Highest recorded temperature.
†† Lowest recorded temperature.

Authorities:—MS. data supplied by Commonwealth Met. Office, Melbourne.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

PLACE—CHRISTMAS ISLAND. LAT. 10° 25′ S., LONG. 105° 43′ E. Height above Mean Sea Level, 18 feet.

Climatic Table compiled from 4 to 46 Years' Observations, 1902 to 1952.

MONTH	PRESSURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		SKY No. of days		RAIN		WIND DIRECTION																		Mean wind force. Beaufort scale		No. of days with wind force 8 or more	No. of days with fog or mist
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in each month	0700	1600	Clear : less than 2 oktas	Cloudy : more than 6 oktas	Average fall	No. of days with 0·04 in. or more	0700									1600									0700	1600		
												Percentage of observations from									Percentage of observations from												
												N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm				
	mb.	° F.	° F.	° F.	° F.	%	%			in.																							
January	1008	88	76	91	72	86	70	3	7	8·7	12	1	1	4	6	13	7	17	4	47	1	1	11	23	26	9	24	5	0	1·0	2·9	0·2	—
February	1008	87	76	91	73	88	75	2	9	11·4	15	1	1	2	4	4	13	39	6	30	0	1	3	7	13	15	50	9	2	1·9	3·4	0·1	—
March	1008	88	76	91	73	89	71	3	7	10·7	17	1	0	8	15	9	4	11	5	47	2	1	24	24	15	10	15	5	4	1·2	2·8	0·1	—
April	1008	88	76	91	74	91	72	2	6	9·2	15	0	1	13	18	4	2	3	0	59	0	4	37	36	15	3	5	0	0	0·7	3·0	0	—
May	1008	87	76	90	73	87	72	2	4	8·3	13	0	0	16	18	6	1	1	1	57	1	3	40	40	11	2	2	0	1	0·9	3·0	0	—
June	1009	86	75	89	72	87	72	2	3	6·3	9	0	0	26	18	2	2	2	1	49	0	4	46	36	7	4	2	1	0	1·0	3·3	0	—
July	1010	85	73	88	70	85	70	2	3	4·0	10	0	1	43	23	0	0	0	0	33	0	2	62	33	2	1	0	0	0	1·3	3·4	0	—
August	1011	86	73	88	70	82	68	4	2	2·0	6	0	0	38	27	4	0	0	0	31	0	0	55	42	3	0	0	0	0	1·2	3·4	0	—
September	1011	86	73	88	70	80	67	3	1	2·0	4	1	1	41	24	3	0	0	0	30	0	1	61	34	3	1	0	0	0	1·3	3·5	0	—
October	1010	87	74	89	71	79	68	3	4	2·2	5	0	0	37	25	10	0	0	0	28	0	1	44	47	7	0	0	0	1	1·4	3·1	0	—
November	1009	87	75	90	72	84	71	2	5	7·3	7	0	1	16	18	14	2	3	2	44	1	3	18	38	22	4	10	3	1	1·1	2·8	0	—
December	1008	87	75	90	72	86	70	4	6	7·5	10	1	1	8	12	18	3	8	2	47	3	1	17	26	27	9	13	3	1	1·0	2·8	0	—
Means	1009	87	75	92*	69*	85	71	—	—	—	—	0	1	21	17	7	3	7	2	42	1	2	35	32	12	5	10	2	1	1·2	3·1	—	—
Totals	—	—	—	—	—	—	—	32	57	79·6	123	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0·4	—
Extreme values	—	—	—	95†	67††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	35	44–46				5		12–14		44-46	24-26	4-6																		5		31-32	—

Standard of time :105° E. meridian.

* Mean of highest each year
** Mean of lowest each year.

† Highest recorded temperature.
†† Lowest recorded temperature.

Authorities :—MS. data at M.O.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

PLACE—DJAKARTA. LAT. 6° 11′ S., LONG. 106° 50′ E. Height above Mean Sea Level, 26 feet.

Climatic Table compiled from 10 to 80 Years' Observations, 1864 to 1945.

MONTH	PRESSURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		SKY No. of days		RAIN		WIND DIRECTION																		Mean wind speed		No. of days with wind speed 33 knots or more	No. of days with fog or mist
												0600									1300												
												Percentage of observations from									Percentage of observations from												
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in each month	0600	1400	Clear: less than 2 oktas	Cloudy: more than 6 oktas	Average fall	No. of days with 0·04 in. or more	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	0600	1300		
	mb.	° F.	° F.	° F.	° F.	%	%			in.																				knots			
January . .	1010	84	74	89	72	95	75	1	18	11·8	18	2	4	8	6	5	7	14	7	47	21	4	2	0	2	5	32	33	1	0·6	4·9	0	—
February . .	1010	84	74	88	72	95	75	1	18	11·8	17	2	2	5	8	6	4	8	6	59	17	7	1	0	1	3	38	33	0	0·4	4·7	0	—
March . . .	1010	86	74	89	72	94	73	2	15	8·3	15	3	1	8	6	4	6	10	3	59	21	9	2	0	0	4	34	30	0	0·4	4·5	0	—
April . . .	1009	87	75	90	73	94	71	4	11	5·8	11	0	1	10	6	1	3	4	2	73	30	29	7	0	0	4	14	16	0	0·2	3·7	0	—
May . . .	1009	87	75	90	72	94	69	5	9	4·5	9	1	5	19	7	2	2	1	0	63	22	47	15	1	1	3	5	6	0	0·2	3·7	0	—
June . . .	1010	87	74	89	71	93	67	6	8	3·8	7	2	6	11	6	3	1	0	0	71	21	40	24	2	1	2	5	5	0	0·2	3·3	0	—
July . . .	1010	87	73	89	70	92	64	8	6	2·5	5	1	2	12	11	4	2	1	0	67	20	37	15	2	2	3	7	13	1	0·2	3·1	0	—
August . .	1010	87	73	90	70	90	61	8	6	1·7	4	0	5	14	13	7	2	0	0	59	32	32	10	2	1	1	4	18	0	0·2	4·3	0	—
September .	1011	88	74	91	71	90	62	7	7	2·6	5	1	3	21	11	9	3	1	1	50	49	18	5	1	0	1	4	22	0	0·4	4·5	0	—
October . .	1010	87	74	91	71	90	64	5	10	4·4	8	0	1	11	18	8	5	1	1	55	45	17	4	1	2	2	7	22	0	0·2	3·7	0	—
November .	1010	86	74	90	72	92	68	3	14	5·6	12	1	2	9	8	5	5	8	2	60	38	14	5	2	1	4	16	20	0	0·2	3·7	0	—
December . .	1009	85	74	89	71	92	71	1	17	8·0	14	1	2	6	9	5	8	15	4	50	27	10	1	1	1	4	28	28	0	0·6	4·1	0	—
Means . . .	1010	86	74	92*	69**	93	68	—	—	—	—	1	3	11	9	5	4	6	2	59	28	22	8	1	1	3	16	21	0	0·3	4·0	—	—
Totals . . .	—	—	—	—	—	—	—	51	139	70·8	125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—
Extreme values	—	—	—	98†	66††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	75	80						61		78	36	10																				16	—

Standard of time: local.

* Mean of highest each year.
** Mean of lowest each year.

† Highest recorded temperature.
†† Lowest recorded temperature.

Authorities :—M.S. data supplied by Meteorological and Geophysical Service, Djakarta.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

PLACE—TANDJUNG PANDAN. LAT. 2° 45′ S., LONG. 107° 39′ E. Height above Mean Sea Level, 10 feet.

Climatic Table compiled from 6 to 63 Years' Observations, 1879 to 1941.

MONTH	PRESSURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		Cloud amount Scale 0—10		RAIN		WIND DIRECTION																		Mean wind force or speed		No. of days with gale	No. of days with fog or mist
												a.m. Percentage of observations from									p.m. Percentage of observations from												
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in Clear less	0600	1600	a.m.	p.m.	Average fall	No. of days with trace or more	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	a.m.	p.m.		
	mb.	° F.	° F.	° F.	° F.	%	%			in.																							
January	—	83	75	86	72	89	78	—	—	10·9	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	—	84	75	86	72	92	75	—	—	6·5	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	—	85	74	87	72	95	77	—	—	7·6	14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
April	—	86	74	90	72	97	81	—	—	10·5	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May	—	87	74	90	72	97	78	—	—	10·1	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June	—	86	73	90	71	97	74	—	—	7·5	14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
July	—	87	73	90	70	96	66	—	—	6·7	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
August	—	88	72	91	69	95	62	—	—	5·6	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
September	—	88	72	91	69	96	66	—	—	6·4	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
October	—	87	73	91	70	96	74	—	—	10·8	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
November	—	85	73	89	71	95	85	—	—	14·6	21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
December	—	84	74	87	72	92	80	—	—	15·9	22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Means	—	86	74	—	—	95	74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	—	—	—	—	—	—	—	—	—	113·1	181	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Extreme values	—	—	—	94†	66††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	—	6						—	—	63		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Standard of time: local.

† Highest recorded temperature. †† Lowest recorded temperature.

Authorities :—MS. data supplied by Meteorological and Geophysical Service, Djakarta.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

PLACE—MANGGAR. LAT. 2° 52′ S., LONG. 108° 16′ E. Height above Mean Sea Level, 16 feet.

Climatic Table compiled from 6 to 62 Years' Observations, 1880 to 1941.

MONTH	PRESSURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		Cloud amount Scale 0—10		RAIN		WIND DIRECTION																		Mean wind force or speed		No. of days with gale	No. of days with fog or mist
												a.m.									p.m.												
												Percentage of observations from									Percentage of observations from												
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in each month	0600	1400	a.m.	p.m.	Average fall	No. of days with trace or more	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	a.m.	p.m.		
	mb.	° F.	° F.	° F.	° F.	%	%			in.																							
January	—	84	74	88	72	93	78	—	—	11·8	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	—	85	74	89	72	92	72	—	—	7·5	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	—	86	74	90	72	92	73	—	—	10·6	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
April	—	87	75	90	73	91	72	—	—	8·9	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May	—	87	76	90	73	89	72	—	—	10·0	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June	—	86	77	89	73	85	69	—	—	8·1	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
July	—	86	78	88	73	82	67	—	—	6·6	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
August	—	86	78	88	72	82	65	—	—	5·0	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
September	—	87	77	89	73	84	65	—	—	4·0	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
October	—	87	76	90	72	87	67	—	—	6·5	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
November	—	86	74	90	72	92	74	—	—	9·6	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
December	—	85	74	89	73	91	78	—	—	13·7	21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Means	—	85	76	—	—	88	71	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	—	—	—	—	—	—	—	—	—	102·3	159	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Extreme values	—	—	—	94†	68††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	—	6						—	—	62		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Standard of time: local.

† Highest recorded temperature.

†† Lowest recorded temperature.

Authorities :—MS. data supplied by Meteorological and Geophysical Service, Djakarta.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

PLACE—PONTIANAK. LAT. 0° 01′ S., LONG. 109° 20′ E. Height above Mean Sea Level, 10 feet.
Climatic Table compiled from 3 to 63 Years' Observations, 1879 to 1948.

MONTH	PRESSURE at M.S.L.	AIR TEMPERATURE Mean of				Relative humidity		SKY No. of days		RAIN		WIND DIRECTION a.m. Percentage of observations from									WIND DIRECTION p.m. Percentage of observations from									Mean wind force or speed		No. of days with gale	No. of days with fog or mist
	Mean	Daily max.	Daily min.	Highest in each month	Lowest in each month	0600	1400	Clear: less than 2 oktas	Cloudy: more than 6 oktas	Average fall	No. of days with trace or more	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	a.m.	p.m.		
	mb.	° F.	° F.	° F.	° F.	%	%			in.																							
January	1010	87	74	91	72	93	69	9	6	10·9	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	1010	89	76	92	72	93	65	8	7	8·2	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	1009	89	74	93	72	93	65	6	9	9·5	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
April	1009	89	75	93	73	93	67	7	7	10·9	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May	1009	90	75	94	73	94	67	9	6	11·1	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June	1009	90	75	93	73	93	64	8	6	9·0	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
July	1009	89	74	93	71	93	61	12	4	6·5	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
August	1009	90	74	93	71	93	59	12	4	8·0	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
September	1009	90	75	93	72	93	61	7	7	9·0	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
October	1010	89	75	92	73	93	67	6	8	14·4	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
November	1010	88	75	92	73	93	72	6	8	15·3	21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
December	1009	87	74	91	73	93	71	5	9	12·7	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Means	1009	89	75	—	—	93	66	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	—	—	—	—	—	—	—	95	81	125·5	184	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Extreme values	—	—	—	96†	68††	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' observations	20							3		63		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Standard of time: local.

† Highest recorded temperature. †† Lowest recorded temperature.

Authorities :—MS. data supplied by Meteorological and Geophysical Service, Djakarta.

METEOROLOGICAL OFFICE,
AIR MINISTRY.

CHAPTER II

COCOS ISLANDS AND CHRISTMAS ISLAND

Chart 2510.

COCOS OR KEELING ISLANDS.—Cocos or Keeling islands are situated about 600 miles south-westward of Tanjong Gedé (Java head), and nearly in the direct route of vessels proceeding to Sunda strait via the Cape of Good Hope. They are in two distinct divisions, lying north and south, having a channel between about 15 miles wide; the northern division consists of one island only, whilst the southern division comprises a group of about 20 islands. Direction and Home islands are the only islands permanently inhabited.

The islands are at present under the administration of the Government of Singapore, which is represented by a Malayan Civil Service Administrator. In 1951, H.M. Government announced their agreement to the transfer of these islands to Australian administration, but this transfer has not yet taken place.

South Keeling.—The islands of the southern division, under the collective name of South Keeling, form a roughly broken circle nearly approaching the horseshoe shape common to coral atolls. All the islands are covered with coconut palms and scrub.

Outside and nearly all round the group a natural barrier protects the lagoon, rendering it smooth inside. Seaward of this barrier, on which the sea breaks continually, the depths increase abruptly. In 1950, s.s. *Strathaird* reported a shoal, with depths of 14 fathoms ($25^{m}6$) over it, about one mile north-westward of Horsburgh island. The lagoon is studded with many coral heads and pinnacles, particularly in its southern and eastern parts and on the reefs running from Horsburgh island (*Lat. 12° 05′ S., Long. 96° 50′ E.*), *see* page 44, towards Home and West islands. These parts of the lagoon are navigable only by light-draught boats with local knowledge. On the western side of the lagoon and in Port Refuge, *see* page 44, there are numerous coral heads with deep water between them. Much of this coral is growing and many heads are not shown on the chart.

The land is evidently rising, and will eventually form a continuous island, surrounding the lagoon with a crater-like edge, similar to North Keeling, *see* page 48. In 1945, the land was nowhere more than 41 feet ($12^{m}5$) high; the tops of the palm trees varied from 40 to 60 feet ($12^{m}2$ to $18^{m}3$) in height above sea level and were then visible at a distance of about 12 miles.

Direction island.—Lights.—Direction island (*Lat. 12° 05′ S., Long. 96° 53′ E.*), situated at the north-eastern corner of the group,

Chart 748b.

Chart 2510.

is about 7 feet (2^{m}1) high and is partly leased by Cable and Wireless, Ltd., which has offices and quarters near the western end. There is a pier, 130 feet (39^{m}6) long, on the south-western side of the island, with a depth of 4 feet (1^{m}2) at its head. There is a derrick on the pier with a lifting capacity of one ton. The pier is connected to storehouses and offices by a light railway. The ruins of a house are situated on the western extremity, and Brown house stands on the western side about 1½ cables from the southern extremity.

A light is exhibited from a mast secured to a tree on the northern side of Direction island, about 4 cables east-north-eastward of the western extremity, when a vessel is expected; the light is obscured by Horsburgh island when bearing less than 110°.

A light is occasionally exhibited from the head of the pier on the same island.

A rocky ledge extends about 2 cables westward from the southern extremity of the island.

Home island.—Home island, lying about one mile southward of Direction island, contains the native settlement, which had, in 1952, a population of about 400. The village, which occupies the greater part of the island, is clean and well laid out. The boat harbour, which is enclosed by a breakwater, has a depth of about 3 feet (0^{m}9), gradually decreasing to one foot (0^{m}3) alongside the pier, on which there is a crane with a lifting capacity of half a ton. A light railway runs from the prominent shed on the pier-head to the Great House, the residence of the Clunies-Ross family, and to the workshops and copra sheds. The approach channel, which is marked by white wooden beacons, is shallow and intricate.

The boat track between Direction and Home islands is indicated on the chart, and should only be used by those with local knowledge.

There are two islets between Direction island and Home island (*Lat. 12° 07′ S., Long. 96° 54′ E.*). Prison islet, the northern, has a conspicuous small group of palm trees on it, and has a clearly defined white shore line; Pulo Gangsa is used as a cemetery. The latter island is bordered by a sea wall, as is also the north-western end of Home island.

There is a group of eleven islets southward of Home island, which can only be approached by vessels of light-draught; their names, from north to south, being Pulos Ampang kechil, Ampang, Wa-idas, Blukok, Kambang, Cheplok, Pandang, Siput, Jambatan, an unnamed islet and Pulo Labu.

South island.—South island, known locally as Pulo Atas, which, with West island, forms the southern half of the group, has a sandy ridge, from 10 to 20 feet (3^{m}0 to 6^{m}1) high, running along its southern and eastern edges, terminating at its southern extremity with a hill 41 feet (12^{m}5) high. The island is infested with land crabs.

Between the western extremity of South island and the eastern extremity of West island are Pulo Klapa Satu, Pulo Blan, Pulo Blan Madar and Pulo Maria, all of which are noticeable from the northern part of the lagoon and from seaward.

West island.—West island, known locally as Pulo Panjang, is low and contains two lagoons on its inner side, namely North and South lagoons, known locally as Telok Jambu and Telok Kambing, respectively, which are almost silted up; a conspicuous bushy tree stands

Chart 748b.

Chart 2510.

on the northern extremity of the island. There are two piers on the eastern side of the island, 2½ and 4 cables, respectively, from Ujong Tanjong, the northern extremity of the island. The northern pier has a depth of 3 feet (0^m9) at its head and the southern pier 2½ feet (0^m8); in 1950, only the northern pier was serviceable. The approach to the southern end of the island is very shallow and consists of an extensive sand and coral mud bank which dries. Farther north landing can be effected from boats at any state of the tide. The island is infested with rats.

In 1952, the construction of a commercial airfield, extending south-eastward from the southern end of North lagoon for a distance of about 1½ miles, was in progress. Buildings in connection with the airfield are being erected in its vicinity, also close to the root of the northern pier on West island and about half a mile south-south-westward of it.

Horsburgh island.—Horsburgh island, known locally as Pulo Luar, is the northernmost island of the group. There is a pier close to Possession point (*Lat. 12° 05′ S., Long. 96° 51′ E.*), the south-eastern extremity of the island; there is a depth of 1½ feet (0^m5) at its head, and it is approached by passing close northward of the wreck situated about one mile south-eastward of Possession point, and thence between numerous coral heads, some of which dry 2 feet (0^m6). In 1950, the wreck was a prominent object at low water, but at high water it was barely visible. There is a residence on the island and an iron framework tower, 85 feet (25^m9) high, stands on Possession point; the tower is almost invisible from seaward, being about the same height as the surrounding palm trees. Possession point can be distinguished from seaward by a clump of palm trees at its extremity.

Port Refuge.—Port Refuge, in the northern part of the lagoon between Horsburgh and Direction islands, comprises an outer and an inner harbour. Caution should be exercised when approaching as the bottom rises very steeply from the ocean depths to the 10-fathom (18^m3) line. The change of colour of the water from a dark to a light shade of blue is, however, very marked; it can be seen from some distance and may be relied on as a guide. The change occurs near the 10-fathom (18^m3) line in all conditions and marks the outer edge of the shelf which slopes gently up from 10 to 6 fathoms (18^m3 to 11^m0) and forms the outer harbour. The bottom is normally visible everywhere in Port Refuge where the depth is less than 8 fathoms (14^m6).

Submarine cables.—**Prohibited anchorage.**—**Buoys.**—Submarine cables run westward from the south-western side of Direction island and thence northward off its western end. A telephone cable also runs from Direction and Horsburgh islands, and is indicated on the chart.

Anchorage is prohibited, northward and eastward of pecked lines on the chart, in an area westward of Direction island. Two white spherical buoys, with staff topmarks, are moored on the southern limit of this area about 3½ cables southward and 5 cables south-westward, respectively, of the western extremity of Direction island. *See* caution on chart and pages 18-20.

The Lagoon.—Although Port Refuge is included in the lagoon proper, the name of The Lagoon is usually applied to that part of the lagoon southward of Port Refuge. The lagoon is separated from Port

Chart 748b.

Chart 2510.

Refuge by a ridge which runs from the reef southward of Horsburgh island to the very shoal water westward and south-westward of Home island (*Lat. 12° 07′ S., Long. 96° 54′ E.*).

The bottom in the lagoon is very uneven. In its southern and eastern parts it consists of coral heads and ridges with deep pools between; in its northern and western parts it is generally deeper with a sandy bottom, but many coral reefs and pinnacles rise very steeply and constitute dangers against which sounding gives no warning. Only the waters of the recommended route, the moored berth and the anchorages have been closely examined, and uncharted dangers may exist in other parts. Even on the recommended route mariners are advised to navigate with great caution. Vessels should not leave the channel.

The visibility of the bottom in the lagoon is in marked contrast to that in Port Refuge. It is normally only visible at slack water when the sea is calm with the sun behind, though rocks, with depths of less than 3 fathoms ($5^{m}5$) over them, can often be distinguished at distances up to 400 feet ($121^{m}9$) in good conditions.

There are two entrances for ships into the lagoon, one at the northern end through Port Refuge, and the other, known as Western entrance, on the western side. There is also a passage known as the Boat passage about one mile southward of Horsburgh island, but this should not be used without local knowledge.

Beacons.—Buoyage.—Cooper's beacon, surmounted by a red diamond shape, stands on a rock about 2¼ miles south-south-eastward of Possession point (*Lat. 12° 05′ S., Long. 96° 51′ E.*); in 1951, the beacon was in ruins.

A cairn, surmounted by a cross, 14 feet ($4^{m}3$) high, stands on the southern extremity of a sandbank, about 5½ cables south-south-eastward of the light on the northern side of Direction island. In 1950, the cairn was washed away; it is replaced occasionally but is not to be relied upon.

Hood beacon, painted in red and white chequers, is situated 11 cables south-south-eastward of the northern extremity of West island. In 1950, this beacon was reported to be no longer visible.

A mooring buoy is situated one mile northward of the ruins of Cooper's beacon; in 1950, it was reported that this mooring buoy was not being maintained, *see* page 46.

The beacons marking the boat track between Direction and Home islands have been mentioned on page 43.

Tophouse conical buoy, painted black, is moored about three-quarters of a mile south-westward of Great House, Home island.

In 1945, two mooring buoys lay about one mile eastward of Ujong Tanjong.

Anchorages.—Berths.—There are two anchorages in the outer harbour suitable for medium to large vessels, on the shelf inside the 10-fathom ($18^{m}3$) line. The western anchorage is in a depth of 7 fathoms ($12^{m}8$), coral and sand, with the ruins of Cooper's beacon (*Lat. 12° 07′ S., Long. 96° 52′ E.*) in line with the middle of the gap between Pulo Blan Madar and Pulo Maria, bearing 175½°, and the western extremity of Direction island in line with Brown house, bearing 096°.

The eastern anchorage is in a depth of 8 fathoms ($14^{m}6$), coral and

Chart 748b.

Chart 2510.

sand, with the eastern extremity of Pulo Maria bearing 180° and the western extremity of Direction island in line with Brown house, bearing 096°. This anchorage is close to the submarine cables running northward, *see* page 44 ; vessels should take care not to anchor eastward and northward of the pecked line indicated on the chart.

The anchorages in the outer harbour may be used by vessels up to a draught of 25 feet ($7^{m}6$) ; they provide good shelter from the prevailing south-easterly winds, but they are completely open to northerly winds, and the shelter is poor if the wind or ocean swell is northward of east. There is always a noticeable decrease of the swell inside the 6-fathom ($11^{m}0$) line. The holding ground is good but there is a danger of loss of ground tackle due to the coral.

There are two anchorages and a mooring buoy in the inner harbour. The western anchorage, known locally as the " Blue patch " from the colour of the deep water, is suitable for small to medium-sized vessels. It lies in a depth of 9 fathoms ($16^{m}5$), sand, about 7½ cables west-south-westward of the southern extremity of Direction island.

The eastern anchorage is in a depth of 8 fathoms ($14^{m}6$), sand, about 3½ cables west-south-westward of the southern extremity of Direction island.

The berth at the mooring buoy situated about one mile northward of the ruins of Cooper's beacon is suitable for vessels with a draught up to 21 feet ($6^{m}4$), and there is good shelter from the swell and from all except northerly winds. In 1950, it was reported that this mooring buoy was not being maintained in a serviceable condition ; *see* page 45.

The anchorages in the inner harbour give far superior shelter in all conditions to that given in the outer harbour or at the mooring buoy, but the narrow entrance with its sharp turn and the lack of swinging room make them unsuitable for large vessels.

There is a berth for a vessel, 375 feet ($114^{m}3$) long, between two mooring buoys, in a depth of 16 feet ($4^{m}9$), sand, one mile eastward of the northern extremity of West island (*Lat. 12° 08′ S., Long. 96° 49′ E.*) ; it is connected to West island by a submarine oil pipeline. There are two anchorages for small vessels in positions about 1¾ miles east-north-eastward of the northern extremity of West island and about 1¼ miles eastward of the same point; the former in a depth of 5½ fathoms ($10^{m}1$), sand and coral, and the latter in 4½ fathoms ($8^{m}2$), sand and coral ; there is swinging room in both anchorages of about three-quarters of a cable radius with depths of more than 3 fathoms ($5^{m}5$).

Directions.—The anchorages in the outer harbour are best approached on the leading lines given on page 45.

A vessel should approach the inner harbour with the ruins of Cooper's beacon in line with the eastern extremity of Pulo Maria, bearing about 179° ; when the western point of Direction island bears about 069° she may steer for the mooring buoy situated 9 cables south-westward of that point. If proceeding to the anchorages in the eastern part of the inner harbour she should alter course so as to pass southward of the white spherical buoy, with staff topmark, moored about 5 cables south-westward of the western end of Direction island, and thence for the anchorages. Care should be taken to avoid the coral reefs on either side of the channel leading to the anchorages ; these reefs are, however, nearly always visible.

Chart 748b.

Chart 2510.

In August 1950, H.M.S. *Loch Quoich* had occasion to enter the inner harbour owing to swell at the outer anchorage. Drawing 14 feet (4^m3), she entered as directed above and moored with both anchors in the "Blue patch," with Prison islet bearing 114°; no local assistance was available. When leaving this anchorage the vessel proceeded direct for the outer anchorage steering with Prison islet (*Lat. 12° 06′ S., Long. 96° 53′ E.*) astern, bearing 122°, and experienced no difficulty.

A vessel proceeding towards the lagoon should steer as directed above for entering the inner harbour, and after passing the white spherical buoy, mentioned above, should continue southward until Prison islet bears 090°, when she should alter course south-westward and be guided by the chart to the anchorages east-north-eastward and eastward of the northern extremity of West island. There is a least depth of 13 feet (4^m0) on this route and a least width of 350 feet (106^m7). It is not affected by the swell except at its northern end near the anchorages in Port Refuge, where the depths and width of the channel are ample.

Western entrance.—The western entrance lies between the reef extending 6 cables northward from Ujong Tanjong and Turk reef, about 8 cables farther north-north-eastward, and is encumbered with numerous coral heads and dangers. There are two channels, but their use is not recommended on account of the ocean swell which is usually prevalent. A complete line of breakers was observed across the entrance when there was a moderate ocean swell from north-westward and a fresh northerly wind.

The northern channel has a least depth of 16 feet (4^m9) in it, and the southern channel 15 feet (4^m6), and both channels are bordered by dangers on either side. The southern channel should only be attempted in boats.

Tidal streams and current.—Slack water occurs about the time of high or low water. In Port Refuge the flood stream sets southward into the harbour at a rate of about three-quarters of a knot. In the western entrance there is little tidal movement on the flood; on the ebb, it sets north-westward at a rate of about half a knot. In general the tidal stream sets into the atoll over the reefs between the eastern and southern islands and outwards from the atoll between Horsburgh and West islands. The current running to the north-westward past the islands, at about 18 miles per day, is increased by the flood stream; with the ebb stream the current is counteracted, and there is little or no water movement.

Harbour facilities.—Poultry, pigs and sheep can be obtained. The lagoon teems with fish and there are also a few turtle and large clams. Sharks are numerous and barracouta have been seen in the inner harbour. Jungle fowl are found on most of the large islands; rats, and the white ant, are very destructive. Bananas and papaws are grown.

Water is obtained from shallow wells, from 3 to 9 feet (0^m9 to 2^m7) in depth, except on Direction island, where it can be obtained only from rain-water tanks.

Small repairs can be effected at the boat yard on Home island (*Lat. 12° 07′ S., Long. 96° 54′ E.*), where several motor launches, sailing lighters and lighters are available.

Communication.—There is telegraphic communication with Perth,

Chart 748b.

Chart 2510.

Durban, Seychelles, Zanzibar and Colombo via Rodriguez and Mauritius. A Naval auxiliary vessel occasionally visits the islands with supplies. There is air-communication with Singapore, Australia and South Africa.

Health.—The climate of the islands is exceedingly healthy during the greater part of the year. June to August are said to be the healthiest months. The hot, close nights usually experienced in the tropics are few.

Disease is rare, though asthma is fairly prevalent amongst the natives. An epidemic of influenza in 1894, and another of measles, in 1945, caused several deaths.

Malaria, dengue, cholera, small-pox or typhoid are unknown in the islands due to the strict quarantine regulations in force. House-flies and non-malarial types of mosquito are plentiful.

There is a doctor employed by the Cable Company.

Standard time.—Information regarding Standard time will be found in the Admiralty List of Radio Signals, Vol. II.

Climatic table.—*See* page 36.

Chart 2510, plan of North Keeling island.

North Keeling island.—North Keeling island (*Lat. 11° 50′ S., Long. 96° 49′ E.*), 15 miles northward of Horsburgh island, is a low strip of coral, thickly covered with coconut trees, enclosing a lagoon ; there is a small break on the eastern side, but the lagoon cannot be entered through it. The only landing place is on the western or lee side of the island, and it is not always practicable on account of the surf ; if the wind gets to the northward of east this landing place is dangerous.

The island is situated on a reef, from which a spit is stated to extend a mile north-westward. Heavy rollers at times rise suddenly off the southern point, making it dangerous to approach. Soundings are said to extend nearly 5 miles south-south-westward, and also for 3 miles eastward of the island. A 6-fathom ($11^{m}0$) patch was reported, in 1914, to lie about half a mile south-westward of the island, and the reefs on the south-western and south-eastern sides of the island are stated to have extended considerably.

The wreck of the German warship *Emden* lies on the southern extremity of North Keeling island ; in 1931 the boilers and parts of the main engines were visible at low water.

Supplies.—A few jungle fowl are preserved ; the island is also the resort of vast numbers of sea birds. Turtle are found in the lagoon, as well as quantities of various fish, including grey mullet, sharks, and dog-fish ; the seine cannot be used with any effect, but there is a fish which may be taken on a rod. Good water may be obtained from a well near the landing-place.

Anchorage.—In 1902, H.M.S. *Vestal* anchored in a depth of 5 fathoms ($9^{m}1$), about 2 cables from the shore, with the western extremity of the island bearing 179°. The anchorage is not good, however, and a vessel must be ready to proceed to sea if the wind shifts to the westward of north, as rollers are very liable to set in.

Charts 748a, 748b.

MARIA AUGUSTINA BANK.—In 1856, the captain of the Spanish frigate *Maria Augustina*, when cruising about 540 miles

Chart 748b.

Charts 748a, 748b.

east-by-south of the Cocos islands, perceived a change in the colour of the water, and soundings taken immediately showed depths of 11, 9, 7, 5, and 13 fathoms ($20^{m}1$, $16^{m}5$, $12^{m}8$, $9^{m}1$, and $23^{m}8$), sand and mud; at the same time a black object, on which the sea broke, was observed about half a mile northward of the vessel. After sailing a further 7½ miles on a course 211° soundings of 6, 8, and 10 fathoms ($11^{m}0$, $14^{m}6$, and $18^{m}3$) were obtained. From good observations taken at the time, and verified later at Tanjong Gedé (Java head), the southern entrance point of the western end of Sunda strait, the position of the rock was established as lat. 14° 05′ S., long. 105° 56′ E.

Discoloured water had been previously reported, in approximately the same position, by the master of the *Helen Stewart* in 1845, who stated that he ran over a milk-white patch for about 50 miles in an east and west direction; no soundings, however, were taken.

The existence of the above bank is considered doubtful.

Chart 3504.

CHRISTMAS ISLAND.—Christmas Island, about 530 miles east-by-north of the Cocos islands and 220 miles southward of Tanjong Gedé (Java head), is of limestone formation, densely wooded and steep-to, and in clear weather may be seen for a distance of 30 miles or more. Seen from the northward or southward, it is saddle-shaped, the middle being considerably lower than the eastern and western portions; and from the sea the island rises to a central plateau in successive terraces and cliffs. Murray hill, 1,170 feet ($356^{m}6$) high and the highest point, is situated about 3¼ miles south-eastward of the north-western extremity of the island; Headridge hill, 1,100 feet ($335^{m}3$) high, is about 1¾ miles south-south-westward of the north-eastern extremity; and Ross hill, 1,060 feet ($323^{m}1$) high, lies about 3½ miles northward of the south-eastern extremity.

The sea face of the island is composed of perpendicular and almost continuous cliffs, 20 to 80 feet ($6^{m}1$ to $24^{m}4$) high, much underworn in places, rendering the island inaccessible, except where the cliff has crumbled away and formed rough beaches, on which, when it is the lee side, landing may at times be effected. The coast in places is undermined by caves ending in vents or " blow-holes " some distance from the sea, through which columns of spray are driven 60 or 70 feet ($18^{m}3$ or $23^{m}3$) into the air. Except in Flying Fish cove, on the northern side of the island, the depths at one cable or less offshore are about 100 fathoms ($182^{m}9$), affording no anchorage; depths of about 1,000 fathoms ($1,828^{m}8$) are found from 2 to 3 miles offshore. The bottom off the eastern side of the island is of a volcanic nature.

Large deposits of phosphate of lime exist on the island. The phosphate quarries are situated at the south-eastern corner of the island, and are connected to Flying Fish cove (*Lat. 10° 25′ S., Long. 105° 43′ E.*) by a railway which runs along the top of the plateau; from the railway terminus on the plateau above Flying Fish cove there is a cable railway down a steep cutting, by which trucks are lowered to ground level and are then taken to the loading piers.

Chart 3504, plan of Flying Fish cove.

Flying Fish cove.—Flying Fish cove lies at the eastern end of a bight formed on the northern coast of Christmas island between

Charts 941a, 748b.

Chart 3504, plan of Flying Fish cove.
North-west point and Rocky point. A coral shelf, with white sand, fronts the beach of the cove, and extends for about one cable into a depth of 5 fathoms ($9^{m}1$); beyond this the water deepens very rapidly with depths of over 70 fathoms ($128^{m}0$) about 2 cables offshore, the bottom being rocky and uneven.

The settlement of the British Phosphate Commissioners, situated in Flying Fish cove, consists of houses for the Europeans and quarters for the Chinese and Malay employees, also a drying factory and storehouses for the phosphate; about 600 coolies are employed. A District Officer of the Colony of Singapore resides on the island, and there is a magistrate's house and police station. A hospital for the employees, equipped with an X-ray apparatus and under the charge of a British doctor, is maintained by the Phosphate Commissioners.

Flying Fish cove (*Lat. 10° 25′ S., Long. 105° 43′ E.*) has been declared a port within the meaning of the Singapore Merchant Shipping Ordiance of 1910, the limits of the port being from Smith point on the western side to a point situated one-third of a cable northward of Isabel beach on the eastern side.

Climatic table.—*See* page 37.

Piers.—Beacons.—Buoys.—In 1950, three piers of light-steel construction were in use. Vessels cannot actually berth alongside these piers but lie at moorings a few feet off, heading northward.

No. 1 pier, about one cable south-westward of Isabel beach, and another pier, about half a cable northward of No. 1 pier, each 31 feet ($9^{m}4$) in height, front the phosphate storing sheds and are used exclusively by vessels loading phosphate, which is delivered rapidly by chutes; vessels of over 300 feet ($91^{m}4$) in length berth off these piers.

No. 3 pier, triangular in shape, about one cable southward of No. 1 pier, is used by vessels not exceeding 300 feet ($91^{m}4$) in length for loading phosphates; in 1950, the southern portion of this pier was being dismantled.

The ruins of a pier, which, in 1946, were submerged, lie about one-third of a cable southward of No. 1 pier.

The line of approach to the two northern piers is indicated by leading beacons; the front beacon, painted white with triangular topmark, point up, stands close northward of Isabel beach, and the rear beacon, painted white with triangular topmark, point down, stands about one-third of a cable eastward of the front beacon. The beacons, in line, bear 095°.

Two mooring buoys, painted white, lie about one cable northward and three-quarters of a cable north-north-eastward of No. 1 pier, and another, painted white, is moored about half a cable southward of the northern end of No. 3 pier.

About 3½ cables east-south-eastward of Smith point (*Lat. 10° 25′ S., Long. 105° 43′ E.*) there is a break in the coral reef, known as the boat channel, off which a vessel can anchor with her stern secured to a mooring buoy laid about three-quarters of a cable offshore. The line of approach to this anchorage and to the boat channel is marked by leading beacons; the front beacon, painted white with triangular topmark, point down, stands close above the high water line and about 3¾ cables east-south-eastward of Smith point, and the rear beacon, painted white, with triangular topmark, point up, stands about 90 feet ($27^{m}4$) south-south-eastward of the front beacon. The beacons, in

Chart 3504, plan of Flying Fish cove.

line, bear 147°. This berth has been occupied by a vessel 360 feet ($109^{\mathrm{m}}7$) in length, with her stern 120 feet ($36^{\mathrm{m}}6$) from the mooring buoy when secured. Depths in the approach decrease very rapidly from about 100 fathoms ($182^{\mathrm{m}}9$), about 2½ cables offshore, to from 40 to 50 fathoms ($73^{\mathrm{m}}2$ to $91^{\mathrm{m}}4$), about 1½ cables offshore. The procedure for anchoring is the same as for berthing off the piers.

Directions for berthing.—A vessel should approach at slow speed on the appropriate leading line with the port anchor lowered to about 60 fathoms ($109^{\mathrm{m}}7$); as soon as the anchor strikes the steeply-rising rocky bottom she should turn on it and veer sufficient cable to allow her to come close to the pier, when she can be secured to buoys, head and stern.

Vessels should not attempt to take up a berth at night, nor until the pilot is on board. Owing to the exposed conditions every precaution must be taken for the safety of the vessel; if making more than the briefest stay fires should be banked and steam ready at shortest notice. A red flag is hoisted at the flagstaff when the anchorage is dangerous. The tidal streams set north-eastward and south-westward; the latter sometimes attaining a rate of from 2 to 3 knots. Strong and erratic currents are often experienced in the cove.

The cove can be an uncomfortable place to lie in and is often untenable if the wind is anywhere except in the south-east quadrant; during the months of November to April ships frequently have to lie off for days on end. The berth off the boat channel, described on page 50, is more secure than the berths off the phosphate piers, as the anchor cable grows right ahead when the vessel is berthed, instead of near the beam.

Pilots.—There are two pilots belonging to the Phosphate Commissioners who undertake the berthing of vessels.

Chart 3504, with plan of Flying Fish cove.

Harbour facilities.—**Communication.**—The landing in Flying Fish cove is at steps on the southern phosphate loading pier and also on the beach about 3½ cables east-south-eastward of Smith point, where the boat channel gives direct access to the shore. At a place known as the Waterfall, about 2¾ miles southward of North-east point, the north-eastern extremity of Christmas island, passengers and mails are sometimes landed from the Phosphate Commissioners' steamer when the swell is too great in Flying Fish cove. Landings have also been effected at West White beach, two miles east-south-eastward of North-west point (*Lat. 10° 26′ S., Long. 105° 35′ E.*), but there is no channel approaching the shore and, owing to the ragged nature of the reef, landing there is difficult and often dangerous. When the swell is too heavy for landing at the pier in Flying Fish cove, a crane is sometimes employed to hoist the boat and passengers clear of the water.

The Phosphate Commissioners' steamer calls at Christmas island from Singapore occasionally; this vessel also visits the Cocos islands occasionally. Three vessels, chartered by the British Phosphate Commissioners, make frequent voyages between Christmas island and Fremantle, Western Australia, carrying phosphate and returning with stores and mails for the island.

Vessels cannot depend on being provided with provisions of any nature, and fuel is unobtainable. Water from springs is laid on to the piers but, owing to the requirements of the local population,

Charts 941a, 748b.

Chart 3504, with plan of Flying Fish cove.

can only be supplied to ships in limited quantity. Pigeons are numerous on the island; one variety, known as *Carpophaga Whartoni*, being unique, is protected. Gannets, frigate, and other sea birds are plentiful; turtle deposit their eggs on the beaches, and an edible fresh water crab is common. All seabirds are protected by ordinance; land crabs are numerous on the island.

Charts 941a, 748b.

CHAPTER III

SUNDA STRAIT

Chart 2056.

SUNDA STRAIT.—Sunda strait is the principal connection between the Indian ocean and the Java sea, and separates the large islands of Java and Sumatra. The western entrance, between Tanjong Gedé (Java head), the western extremity of Java, and Vlakke hoek, in Sumatra, about 64 miles north-westward, is very deep in the southern part, but in the northern part a bank, with depths of about 30 fathoms (54^{m}9), and less, extends for 25 miles southward from the southern end of the Benkulen peninsula, when it falls suddenly into depths of over 100 fathoms (182^{m}9). In the middle of this entrance there are depths of over 1,000 fathoms (1,828^{m}8), but inside the strait the depths decrease rapidly, and there are not more than about 50 fathoms (91^{m}4) between Tanjong Lesung (Third point), in Java, and the Legundi eilanden, off the Sumatra shore. Channels, with depths of from 60 to 70 fathoms (109^{m}7 to 128^{m}0), have been scoured out by the current on either side of Sangiang (*Lat. 5° 57′ S., Long. 105° 51′ E.*), known by the Dutch as Dwars in den weg, thereby forming a bank with depths of under 20 fathoms (36^{m}6), which extends about 7 miles south-westward from the south-western side of that island.

In the outer part of the strait the bottom consists of sand and mud, and sand mixed with stone in the northern or inner portion; in the channel on either side of Sangiang the bottom is sand mixed with stone and shells.

The strait can be entered from westward by Behouden passage, between the Java coast and Panaitan (Princes island) or by Great channel, between that island and Krakatau. Vessels can then pass on either side of Sangiang; the fairway of the eastern channel is clear, but in the western is Stroom klip and farther north-eastward is Winsor klip. On the northern side of the strait there is a clear channel between Sebesi and Sebuku, and also between the latter and Sumatra.

For Directions, *see* page 78.

Aspect.—The coast of Sumatra, which forms the northern side of the strait, slopes gently down to the sea; it is densely wooded and has several high peaks inland. Tanggamus, at the head of Semangka baai, being 6,896 feet (2,101^{m}9) high, with a regular sharp cone; this peak and Tabuan, an island in the entrance of the bay, are the first to be made out when approaching Vlakke hoek (*Lat. 5° 56′ S., Long. 104° 33′ E.*). *See* views facing pages 54, 62, 63.

Charts 1653a, 2781, 941a, 1263.

Chart 2056.

The Java coast is not so high, and has a low coastal district over a great portion of its length; it also is densely wooded, and is cultivated here and there in the northern part. There are several high islands in the strait. *See* views facing pages 54, 55, 63.

Currents and tidal streams.—The tidal streams in Sunda strait, in contrast to the weak almost entirely semi-diurnal vertical movement, are strong and of a mainly diurnal character.

The stream flows usually only once each day in either direction. The flow is influenced by a current which, from April to September, sets south-westward at rates of ¾ to 1¼ knots with light easterly or northerly winds. From October to March, with south-westerly winds, the current may be reversed and set north-eastward at a rate of half a knot. During November a current flows north-eastward through Sunda strait.

When the flow is strongly to the south-westward, sharply defined tide-rips are often met with in the northern entrance to the strait. With such a flow the rates are very great along the north-western and southern sides of Sangiang (page 62), causing heavy tide-rips there and a whirlpool in the bay on the south-western side of the island. Near Stroom klip strong eddies occur when the stream is flowing strongly. In Rede Merak the times at which the streams turn and reach their maximum rates are probably very similar to those off Sangiang, while the rates are probably slightly less. When the flow is strong tide-rips are formed over Java rif. As the strait widens out the rates probably decrease, and the times at which the streams flow probably change quickly. Off Tanjong Chikoneng (Fourth point) the times at which the streams flow are 2 to 3 hours earlier than those off Sangiang.

In the Java sea the influence of the monsoon currents is predominant and the tidal streams are hardly appreciable.

The tidal streams in Sunda strait [off Sangiang (Thwartway island) *Lat. 5° 58′ S., Long. 105° 55′ E.*] are predicted in Admiralty Tide and Tidal Stream Tables. They set roughly north-east and south-west. The predictions give the time of maximum rate in either direction, the times of turn and the maximum rate in either direction. To the predicted tidal streams must be added the current described above.

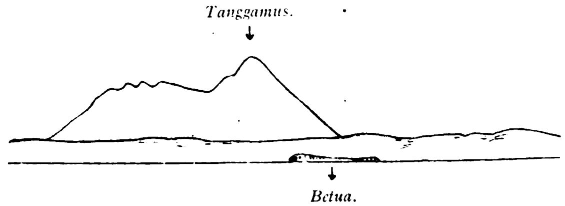
SOUTH-EASTERN SIDE OF SUNDA STRAIT.—Coast.—Light.—Dangers.—The south-western extremity of Java consists of a peninsula, named Ujong Kulon, joined to the main island by a low, narrow, swampy isthmus; this peninsula rises in the south-west to a densely wooded mountainous land, of which Payung, 1,598 feet ($487^{m}1$) high, is the summit. On the northern side these mountains descend gradually to Tanjong Layar (First point) (*Lat. 6° 45′ S., Long. 105° 13′ E.*), at the entrance to Behouden passage.

Tanjong Guha Kolak, the south-western extremity of Ujong Kulon, is rendered prominent by a hill, 689 feet ($210^{m}0$) high, close within the point. Changkuang, 1,273 feet ($388^{m}0$) high, about 1¼ miles eastward of this hill, is very prominent from eastward and westward.

Two large rocks, above water, lie close off Tanjong Guha Kolak, with a rock awash outside them. Karang Pabajang, above water, lies about 1½ miles east-south-eastward of Tanjong Guha Kolak and about 4 cables southward of Tanjong Changkuang; other rocks

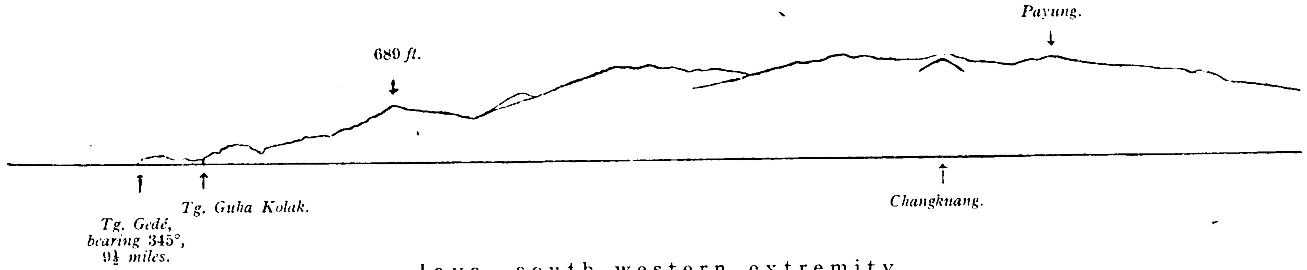
Charts 1653a, 2781, 941a, 1263.

To face page 54.



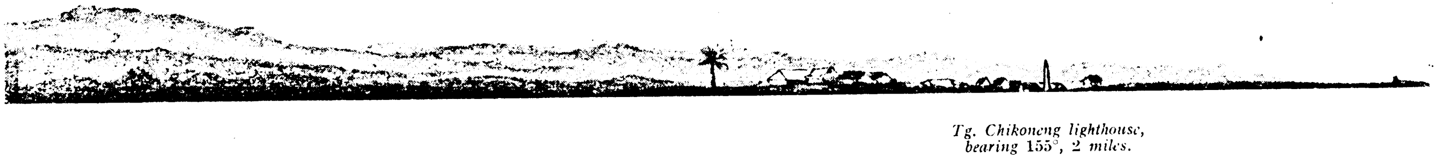
Tanggamus, bearing 028°.

(*Original dated* 1929.)


689 *ft.*
Payung.
Tg. Gedé, bearing 345°, 9½ miles.
Tg. Guha Kolak.
Changkuang.

Java, south-western extremity.

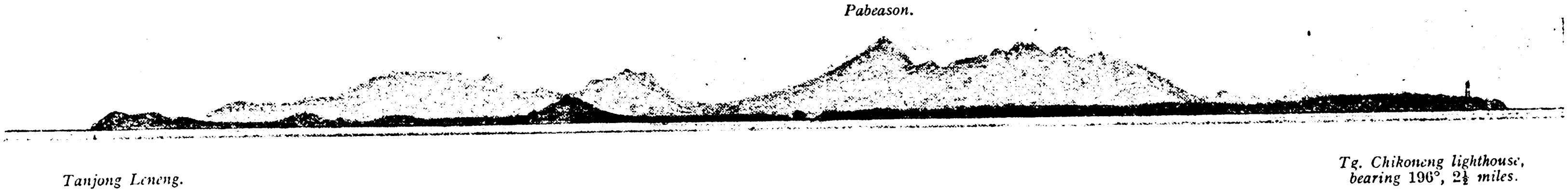
(*Original dated* 1929.)


Tg. Chikoneng lighthouse, bearing 155°, 2 miles.

Tanjong Chikoneng; Java, west coast.

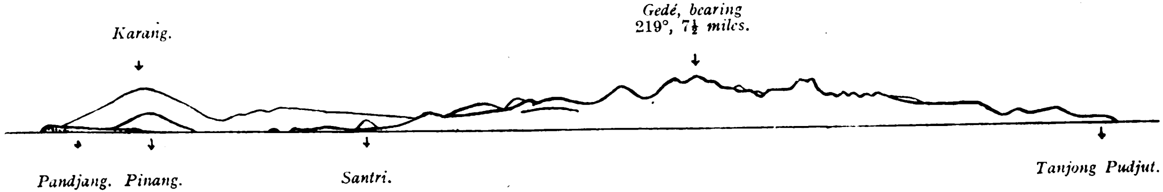
(*Original dated* 1902.)

To face page 55.


Pabeason.
Tanjong Leneng.
Tg. Chikoneng lighthouse, bearing 196°, 2½ miles.

Java, west coast between Tanjong Leneng and Tanjong Chikoneng.

(*Original dated* 1902.)



Java, north-western extremity; land in the vicinity of Tanjong Pudjut.

(*Original dated* 1929.)

Chart 2056.

fringe the coast, the sea breaking heavily over them. The depths are very great close-to, and the coast should not be approached within 2 miles.

The south coast of Java, eastward of Tanjong Changkuang, is described in the Eastern Archipelago Pilot, Vol. II.

Tanjong Gedé (Java head), about 5 miles north-north-westward of Tanjong Guha Kolak, is a prominent rocky headland separated from the main slope within it by a low tongue of land, and appears from southward as a bluff point with a small flat-topped hill inside and a rock outside.

When making the head in hazy weather, the appearance of the land eastward of Tanjong Guha Kolak, between it and Tanjong Sodong, 18 miles eastward, bears much resemblance to that of the west point of Java, with the adjacent hills on Panaitan; and the low land in such circumstances not being distinguishable at a distance, the position of it has been mistaken for the entrance to Behouden passage. *See* view on chart 2056 and view facing page 54.

Several rocks, above and below water, lie within half a mile of the coast between Tanjong Guha Kolak and Tanjong Gedé, and there is always surf over them.

Tanjong Layar (First point), the southern entrance point of the south-western end of Behouden passage, is a low rocky point with some high trees and shrubs on it; farther inland it is thickly wooded. Some rocks above and below water lie close off the point, including Monnik rots.

A light is exhibited, at an elevation of 163 feet ($49^{m}7$), from a white iron framework structure, 65 feet ($19^{m}8$) in height, on Tanjong Layar (*Lat. 6° 45′ S., Long. 105° 13′ E.*).

Meeuwen (Mew) baai is entered between Tanjong Layar and Tanjong Senini, a broad, wooded point with a prominent beach, 8½ miles north-eastward; the shore of the bay is low, densely wooded, uninhabited, and fringed by a narrow coral reef. Pöchang (Mew island), in the southern part of the bay, 256 feet ($78^{m}0$) high, is thickly wooded and fringed by a narrow coral reef, with three rocks lying on it off Tanjong Chopong, the north-western point, which is steep; there is a narrow passage between the island and the main coast, but a reef lies in the northern part. Small vessels with local knowledge may obtain good anchorage in this passage. Water can be obtained on the Java shore eastward of Pöchang; it falls in a cataract on the beach. Large boats may approach the spot at high water by a narrow channel through the reef, and fill by a hose. Meeuwen stenen (Mew stones) are a couple of rocks above water about one mile eastward of Tanjong Layar and about 1½ cables offshore.

Landing can be effected in Meeuwen baai on the sandy beach there, although this is rendered somewhat difficult by the almost continuous surf and the numerous rocks on the drying coastal reef.

Tanjong Alang Alang (Second point), the low, wooded northern extremity of Ujong Kulon, and nearly 3 miles north-eastward of Tanjong Senini, has a noticeable patch of sand on its outer end.

Panaitan.—Anchorages.—Panaitan (Princes island), the largest island in Sunda strait, is hilly and densely wooded except in its south-western part; it is uninhabited. The highest peak, named Raksa (*Lat. 6° 36′ S., Long. 105° 15′ E.*), near the eastern coast, is 1,050 feet

Charts 1653a, 941a, 1263.

Chart 2056.

(320^{m}0) high, and Parat, a hill near the north-eastern extremity, is 614 feet (187^{m}1) high; a long spur extends south-westward from this hill, rising to the prominent hill Darahayu, 525 feet (160^{m}0) high, near the north-western coast. Tanjong Waton and Tanjong Sabini, forming the south-western extremity of the island, are fringed by extensive reefs, with some sandbanks and rocks above water, which extend about half a mile southward from these points. A rock, which dries, lies about 8 cables south-south-eastward of Tanjong Sabini.

Kasuaris baai, on the south-western side of the island, is entered between Tanjong Sabini and Tanjong Karangburung, about 3¼ miles south-eastward; the inner part has convenient depths for anchoring, but it is entirely open to the heavy southerly swell. Small vessels may obtain sheltered anchorage northward of the coastal reef extending from Tanjong Chidarahayu on the eastern side of the bay and about 3½ miles northward of Tanjong Karangburung, where landing can also be effected. A 2¾-fathom (5^{m}0) shoal lies about half a mile north-westward of this point.

In the east monsoon anchorage may be obtained in Legon Kadam on the northern side of the island; both entrance points of this bay are named Tanjong Kadam, and a lagoon penetrates far inland within the entrance point. The inhabitants of Labuhan (page 58), on the Java coast, come here to fish during the east monsoon.

There is good anchorage, during the west monsoon, in Legon Pamageran, on the eastern side of the island and about 1½ miles southward of Tanjong Parat, the northern extremity of the island, in a depth of 13 fathoms (23^{m}8), with Parat heuvel bearing 288°, and Raksa, 205°. This berth is about 1½ cables from the coastal reef, through which a channel, with depths of about 7 fathoms (12^{m}8), leads to the beach in the direction of Parat heuvel. Landing can always be effected here during the west monsoon.

Legon Semadang, also on the eastern coast and about 3 miles north-eastward of Tanjong Karangdjadjar (Karangjajar), the southern extremity of the island, is another landing place, provided there is not too much swell; the coastal reef extends about half a mile from the southern side of this cove.

Batu Putih, a prominent rock, lies just offshore and about one mile north-eastward of Tanjong Karangdjadjar.

Behouden passage.—Behouden passage, between the north-western side of Ujong Kulon and Panaitan, is free of dangers, but the Panaitan shore should not be approached within one mile on account of Karangdjadjar (Karangjajar) eilanden, off Tanjong Karangdjadjar (Karangjajar), and the extensive coastal reef southward of Legon Semadang; these dangers are always marked by surf.

Welkomst baai.—Dangers.—Welkomst baai is entered between Tanjong Alang Alang and Tanjong Palagan, 12 miles eastward; the beach at its head is only separated from the south coast of Java by a low neck less than one mile wide. In the fairway of the entrance to the bay are depths of from 23 to 25 fathoms (42^{m}1 to 45^{m}7), decreasing gradually to 8 fathoms (14^{m}6) eastward of the Handölöm eilanden and to 2 fathoms (3^{m}7) near the head.

In the west monsoon the whole of the western and southern shores of the bay are marshy; the eastern shore consists largely of sandy beaches. The inner part of the bay is named Lorogan Chilintang.

Charts 1653a, 941a, 1263.

Chart 2056.

Panter riffen, with a least depth of 1½ fathoms ($2^{m}7$) over them, lie nearly in the middle of the entrance of the bay and about 5½ miles eastward of Tanjong Alang Alang; they are marked by discoloration. A reef, with a depth of 3 fathoms ($5^{m}5$) over it, lies about 4 miles east-south-eastward of Tanjong Alang Alang and midway between Panter riffen and the western shore of the bay. Batu Kapur Baru, with a depth of 2¾ fathoms ($5^{m}0$) over it, is situated 1½ miles westward of Badul (*see* below), and there are several reefs within a distance of about 1½ miles southward and south-westward of this islet.

Handölöm eilanden are two thickly wooded islets lying about half a mile north-eastward of Tanjong Kalong (*Lat. 6° 46′ S., Long. 105° 25′ E.*), on the western side of the bay and 7½ miles south-south-eastward of Tanjong Alang Alang; there is a rock, which dries, about 8 cables north-eastward of the eastern islet. Boboko is an islet lying about 3 cables northward of Tanjong Kadongdong, which is situated about 1¼ miles south-eastward of Tanjong Kalong. Badul, an islet, lies 1½ miles northward of Tanjong Tanchang Pare, on the eastern shore and about 5 miles south-westward of Tanjong Palagan. Mangir is an islet lying about a quarter of a mile off Tanjong Tangkil, situated about 4½ miles north-eastward of Tanjong Tanchang Pare. Sumur is an islet connected to the coast close northward of Tanjong Palagan by a reef with little water over it. Oar and Umang are two islets lying close northward of Sumur. Except Pamagangan, which is a bare patch of sand at the head of the bay, all the islets are thickly wooded, uninhabited, and fringed by reefs.

There is good holding ground in Welkomst baai, but the anchorage is only moderately good, as there is a turbulent sea in the east monsoon and also in the west monsoon when the wind is at all northward. Landing can be effected north-westward of the Handölöm eilanden and on several small sandy beaches on the eastern shore of Welkomst baai during the east monsoon.

Coast.—Between Tanjong Palagan and Tanjong Chamara, 5 miles north-eastward, the coast is low; thence to Tanjong Lesung (Third point), about 8½ miles north-north-eastward, it is rocky in places. Close inland are several hills, including Batu Hidöng, 900 feet ($274^{m}3$) high, about 4 miles south-south-westward of Tanjong Lesung, and thence the land becomes lower and flatter in the vicinity of Tanjong Lesung. A spur running northward from Batu Hidöng terminates near the coast in a very prominent hill named Batu Chawar, 469 feet ($142^{m}9$) high, situated about 3 miles south-westward of Tanjong Lesung. Along the whole of this part of the coast there are numerous patches of cultivated land and coconut plantations. A few streams discharge into the sea, the largest being the Chidjaralang ((Chijaralang), which flows out 3¼ miles north-eastward of Tanjong Palagan. Sumur village is situated near Tanjong Palagan and Chamara village close north-eastward of Tanjong Chamara.

Tanjong Lesung (*Lat. 6° 28′ S., Long. 105° 40′ E.*) is a low, wooded point with a sandy beach; it has a hillock, 46 feet ($14^{m}0$) high, on it.

Peper baai.—Dangers.—Peper baai is entered between Tanjong Lesung and Popolé, a low, sandy islet covered with vegetation, about 9½ miles north-eastward and about three-quarters of a mile offshore. In the south-western part of the bay the hills run down to the coast, but elsewhere there is a broad strip of low land, reaching its greatest

Charts 1653a, 941a, 1263.

Chart 2056.

width near the Chibungur, the mouth of which lies 8½ miles eastward of Tanjong Lesung. Several rivers flow into the bay, the Chiliman, about one mile south-westward of the Chibungur, being the principal. Only here and there, near the southern shore of the bay, are a few native dwellings; the remainder of the coast is uninhabited.

Pasir Gundul, about 1¼ miles eastward of Tanjong Lesung, is a coral bank mostly above water, and visible from a considerable distance owing to its white appearance. Liwungan, a low, wooded islet, about 3¼ miles east-south-eastward of Tanjong Lesung, is fringed by a reef; a detached sandbank, which partly dries, lies about 3 cables north-westward of it, and is usually marked by surf. Gosong Panjang, about 1¼ miles south-westward of Popolé, has a least depth of 7 feet (2^{m}1) over it, and, being steep-to, is dangerous, as the sea does not often break on it, although it can generally be distinguished by discoloration. A rock, which dries, lies 2¾ miles south-south-westward of Popolé (*Lat. 6° 24′ S., Long. 105° 49′ E.*) and about 1¾ miles offshore, with a 3-foot (0^{m}9) patch about 2½ cables eastward of it. A shoal, with a depth of 5 feet (1^{m}5) over it, is situated one mile farther south-south-westward.

There is a boat channel, with depths of from 1½ to 2 fathoms (2^{m}7 to 3^{m}7), through the reef connecting Popolé and the shore eastward.

Peper baai affords safe anchorage in the east monsoon, but it is unsuitable in the west monsoon. The bottom consists of mud within the 10-fathom (18^{m}3) line.

Rede Labuhan.—Lights.—Dangers.—Labuhan is an unimportant settlement, consisting mainly of Chinese, situated near the mouth of the Chiputanagung, which flows out about 11 miles east-north-eastward of Tanjong Lesung. It is connected by rail with Djakarta (Batavia). There is a stone dam on the northern side of the entrance to Chiputanagung; praus can only pass in and out of the river at high water, and a blue flag is displayed if conditions are unfavourable.

A light is exhibited, at an elevation of 23 feet (7^{m}0), from an iron column on the southern entrance point of the Chiputanagung. A light is also exhibited on the northern side of the entrance to the river.

The roadstead is bounded by the parallels of 6° 22′ S. and 6° 23·5′ S. and by the meridian of 105° 48′ E.

A shoal, with a depth of 1¾ fathoms (3^{m}2) over it, lies about one mile westward of the mouth. Karang Kebua, about 2 miles northward of Popolé, and about half a mile offshore, is a coral reef with a sandbank on it, marked by breakers; a rock, with a depth of 5 feet (1^{m}5) over it, lies between Karang Kebua and the coast.

Coast.—Lights.—Prohibited anchorage.—Northward of Charingin, a small village 1½ miles northward of Labuhan, the hitherto low coastland rapidly narrows, and the wooded slopes of the mountainous land approach close to the coast. Telok Charita is entered between Tanjong Gelebeg, about 3¾ miles northward of Labuhan light-structure, and Tanjong Katapang, a rocky point about 1¼ miles farther northward; some rocks above water lie close off the latter point. Eastward of the bay are the prominent mountains Pulasari, 4,412 feet (1,344^{m}8) high, and Asöpan, 3,806 feet (1,160^{m}1) high, lying 9 miles eastward and 6 miles east-north-eastward, respectively, of Tanjong Gelebeg (*Lat. 6° 19′ S., Long. 105° 50′ E.*). About 7½ miles

Charts 1653a, 941a, 1263.

east-north-eastward of Asöpan is Karang, 5,824 feet (1,775^{m}2) high, with its triple peaks.

A light is exhibited, at an elevation of 26 feet (7^{m}9), from an iron column, near the beach in Telok Charita.

Tanjong Soraga, 7½ miles northward of Tanjong Katapang, is prominent on account of a rock on it, and a hillock on the coast close northward of it.

At some places along the coast are high sloping sandy beaches, where landing can easily be effected; such is the case by the mouth of Pasang Tenang, 2 miles northward of Tanjong Soraga, which is sheltered on the northern side by a coral reef. The mouth of this river may be identified by an isolated rock, named Batu Saun. Northward of Pasang Tenang there is a bank along the coast, consisting of clay and sand, which affords good anchorage.

Eastward of Pasang Tenang a number of peaks rise close together. The highest of these is Gedé, 2,428 feet (740^{m}0) high, 5½ miles east-north-eastward of Tanjong Soraga and the northernmost Pabeasan, 1,936 feet (590^{m}1) high, with a cone-shaped summit; Merak, the westernmost, is 1,772 feet (540^{m}1) high, and also cone shaped, with two peaks.

Catharina rotsen (Catherine rocks) are two rocks above water, surrounded by a reef, lying about 7 cables west-south-westward of the mouth of Pasang Tenang; they are visible from a distance of about 3 miles. Several reefs lie within about 3½ cables northward and north-eastward of them.

A submarine cable passes northward of Catharina rotsen and is landed near the mouth of Pasang Tenang; anchorage is prohibited in its vicinity.

Tanjong Chikoneng (Fourth point), about 4 miles north-north-eastward of the mouth of Paseng Tenang, is low and overgrown with brushwood, but may be identified by the lighthouse on it. Anyer Kidul village is situated near the point; it is connected to Djakarta by rail, and to the general telegraph system. The best anchorage is southward of the point, on the sand and clay coastal bank between it and Catharina rotsen with good holding ground, but off Tanjong Chikoneng the holding ground is bad. *See* view facing page 54.

A light is exhibited, at an elevation of 178 feet (54^{m}2), from a white iron tower, 190 feet (57^{m}9) in height, on Tanjong Chikoneng (*Lat. 6° 04′ S., Long. 105° 53′ E.*).

Anyer Lor village, about 2½ miles north-eastward of Tanjong Chikoneng, may be identified by a hill, 197 feet (60^{m}0) high, near the coast northward. It is connected to the general railway and telegraph systems of the island.

A light is exhibited from a wooden post, on the seaward end of a stone pier on the southern side of the channel leading to Muara Paku, which flows out close northward of Anyer Lor.

Anchorages.—Anchorage off Anyer Lor village is not easily found, but it can be approached by bearings of the summit of Sangiang, known by the Dutch as Dwars in den weg (page 62), which is visible here in the haziest weather in the east monsoon, and of the lighthouse on Tanjong Chikoneng.

There is good anchorage in a depth of 12 fathoms (21^{m}9), 3 cables from the drying coastal reef, with the lighthouse on Tanjong Chikoneng

Chart 2056.

bearing 230°, and the summit of Sangiang bearing 320°. Small vessels can anchor, in a depth of from 4 to 5 fathoms ($7^{m}3$ to $9^{m}1$), in an inlet near Anyer Lor during the east monsoon. This inlet was formed by the eruption of Krakatau, and even as far out as a depth of 2 fathoms ($3^{m}7$) the remains of houses and trees are to be found; although it provides shelter it is dangerous owing to sunken rocks and heavy breakers.

Rede Anyer Lor is bounded by the meridian of Brabandshoedje (Brabands island), *see* below, and by a line drawn in a 223° direction from Brabandshoedje to meet a line drawn in a 315° direction from a position on the coast 5½ cables north-eastward of the lighthouse on Tanjong Chikoneng (*Lat. 6° 04′ S., Long. 105° 53′ E.*).

Aspect.—Within Tanjong Chikoneng there is a plain between the coast and the hills; near Tanjong Leneng, about 4½ miles north-eastward of Tanjong Chikoneng, the coast is rocky, and there are two hills, about 130 feet ($39^{m}6$) high. The plain is broken by the Marengmang gebergte, 886 feet ($270^{m}0$) high at its southern end, stretching in a north-north-westerly direction to Tanjong Leneng. About 2 miles eastward of the range is Mokol, 722 feet ($220^{m}1$) high, with a truncated cone.

The plain northward of Marengmang gebergte becomes narrower towards Merak (page 61); cultivated areas stretch close to the coast, which is everywhere overgrown with brushwood. Northward of the plain is St. Nicolaas gebergte, which extends to Tanjong Pudjut (St. Nicolas point). The highest peaks of this range most easily identified are Gedé and Batur, 1,949 and 1,814 feet ($594^{m}1$ and $552^{m}9$) high, respectively. Gedé has a flat summit, and is visible as far northward as Pulau Segama (page 82) in clear weather; Batur has a rocky sharp summit. *See* views facing pages 55, 76, 77.

Northward of Merak besar (page 61) some high wooded points give the coast a strange appearance; they drop sheer into the sea, and terminate in a coral reef about half a cable wide. There are sandy beaches between the points, which afford landing; several streams find their outlet here, but they are choked during the easterly monsoon.

Coast.—Dangers.—Tanjong Leneng is rocky and fringed by a narrow reef. A reef, with a depth of 2½ fathoms ($4^{m}6$) over it, lies 2 cables northward of the point, and is not easily distinguished.

Outside the 5-fathom ($9^{m}1$) line the depths increase regularly, rapidly near Tanjong Chikoneng, but more gradually farther north-eastward. The 5-fathom ($9^{m}1$) line extends half a cable beyond Tamposo (page 62).

Depths of 25 fathoms ($45^{m}7$) are found about one mile offshore here, deepening off Tanjong Pudjut.

Brabandshoedje (Brabands island), 154 feet ($46^{m}9$) high, is a rock covered with vegetation, which rises steeply from depths of about 20 fathoms ($36^{m}6$), and may be approached closely on all sides. The channel between Brabandshoedje and Tanjong Leneng (*Lat. 6° 01′ S., Long. 105° 57′ E.*) is clear except for the reef described above. Pinang, a hill, 853 feet ($260^{m}0$) high, about 10 miles east-south-eastward of Tanjong Leneng, is a prominent object seen over the low undulating land from here.

Brouwers zand consists of a bank of hard sand running parallel with the coast, at a distance of 1½ miles from it, southward of Merak

Charts 1653a, 941a, 1263.

Chart 2056.

besar; 2¾-fathoms (5^{m}0), the least depth, lies near the north-eastern extremity. On the outer side of the bank the depths increase rapidly from 16 to 20 fathoms (29^{m}3 to 36^{m}6), hard ground, and on the inner side from 10 to 14 fathoms (18^{m}3 to 25^{m}6), mud and sand, and sand and coral. Tanjong Chikoneng, bearing about 212°, open north-westward of Brabandshoedje, leads north-westward of Brouwers zand.

Kerungo, a coral reef which dries, lies about 2 cables offshore and 4 miles north-eastward of Tanjong Leneng (*Lat. 6° 01′ S., Long. 105° 57′ E.*).

Chart 2056, plan of Merak road.

Rede Merak.—Dangers.—Beacons.—Buoys.—Merak besar, a wooded island, 216 feet (65^{m}8) high, 5½ miles north-eastward of Brabandshoedje, is fringed by a narrow coral reef, which is steep-to on its north-western side. Merak kechil, 4½ cables south-eastward of Merak besar and about 1½ cables offshore, is a low islet.

Tarembu, a rock which dries, lies in the middle of the western side of an extensive reef, with depths of less than 5 fathoms (9^{m}1) over it, lying between Merak besar and Merak kechil. There is a 2¾-fathom (5^{m}0) patch about one cable northward of Tarembu, and a patch, with a depth of 3 fathoms (5^{m}5) over it, lies eastward of it.

Rede Merak is bounded by a line drawn in an 045° direction from the northern extremity of Merak besar to the coast, and by the parallel of the southern extremity of Merak besar.

The western side of the channel between Merak besar and Tarembu is marked by a beacon, surmounted by a black truncated cone, on the edge of the coastal reef on the eastern side of Merak besar. The eastern side is marked by a beacon, surmounted by a white ball, near the western side of Tarembu, and a white conical buoy is moored close westward of the 2¾-fathom (5^{m}0) patch northward of the rock.

The western side of the channel between Tarembu and Merak kechil is marked by a black can buoy moored about half a cable eastward of the eastern edge of the 3-fathom (5^{m}5) patch on Tarembu reef. The eastern side is marked by a beacon, surmounted by a white ball topmark, on the edge of the reef extending about half a cable from the western side of Merak kechil (*Lat. 5° 56′ S., Long. 106° 00′ E.*).

The strait between Merak besar and the coast affords the only sheltered anchorage on the west coast of Java; there is practically no swell there, as Tarembu and Merak besar act as breakwaters. The maximum rate of the stream is not more than 2 knots. Vessels may enter from southward, passing on either side of Tarembu, as there are depths of from 5 to 8 fathoms (9^{m}1 to 14^{m}6) in both channels; there is usually a south-going current in the strait. The channel northward of Merak besar is narrowed by a bank extending about three-quarters of a cable from that island, and there is a 4¼-fathom (7^{m}8) patch nearly in mid-channel.

There is a pier, sheltered from the swell, on the Java shore north-eastward of Merak besar, near Pulomerak village. A concrete quay, about 410 feet (125^{m}0) in length, is situated eastward of the pier; craft with a maximum draught of 7 feet (2^{m}1) can berth alongside. Water can be obtained here. The entrance to a prau harbour, in which there is a least depth of about 3 feet (0^{m}9) at low water spring tides, lies eastward of the concrete quay.

Communication.—There is regular steamer communication

Charts 1653a, 941a, 1263.

Chart 2056, plan of Merak road.

between Pulomerak and Pandjang (Panjang) harbour (page 73), thus connecting Djakarta with Sumatra, as Pulomerak is connected to Djakarta by rail; it is also connected to the general telegraph system.

Chart 2056.

Coast.—Danger.—The coast between Pulomerak and Tanjong Pudjut (St. Nicolas point) (*Lat. 5° 53′ S., Long. 106° 03′ E.*), 4½ miles north-eastward, is high and broken by steep points; it is fringed by a coral reef half a cable wide, with numerous rocks above water. Tamposo is an islet lying near the edge of the coastal reef about midway along this portion of the coast, and, as it is almost entirely bare, is difficult to distinguish; praus and small craft find good shelter in the narrow channel between this islet and the coast, where there are depths of from 2 to 5 fathoms ($3^{m}7$ to $9^{m}1$).

Tanjong Pudjut (St. Nicolas point), the north-western extremity of Java, is a narrow tongue of land, 43 feet ($13^{m}1$) high, and, when clear of the high land behind, can be seen from a considerable distance. Northward of the point the depths decrease rapidly, the bottom being hard ground and sand close inshore, and sand, stones and shells farther northward. The north coast of Java eastward of Tanjong Pudjut is described in the Eastern Archipelago Pilot, Vol. II.

Java rif, a small coral patch, with a depth of 4¾ fathoms ($8^{m}7$) over it, lies about one mile northward of Merak besar and about 6 cables offshore; when the stream is running from 1 to 2 knots the reef is marked by ripples, and sometimes by discoloured water.

Islands and dangers in northern entrance to Sunda strait.—Light.—Sangiang, known by the Dutch as Dwars in den weg, an island in the middle of the narrowest part of Sunda strait, is easily identified, and from a distance appears to consist of several islets. There are some hills along its south-western side, the highest having an elevation of 509 feet ($155^{m}1$); on the northern side there is a plain. The north and east coasts are fringed by a narrow reef; on the south-eastern side the reef projects about 2¾ cables, and is often marked by heavy surf; from about the middle of the south-western side a reef extends about one cable, otherwise this side is clear. A rock lies close off the western extremity of the island and also off the southern extremity.

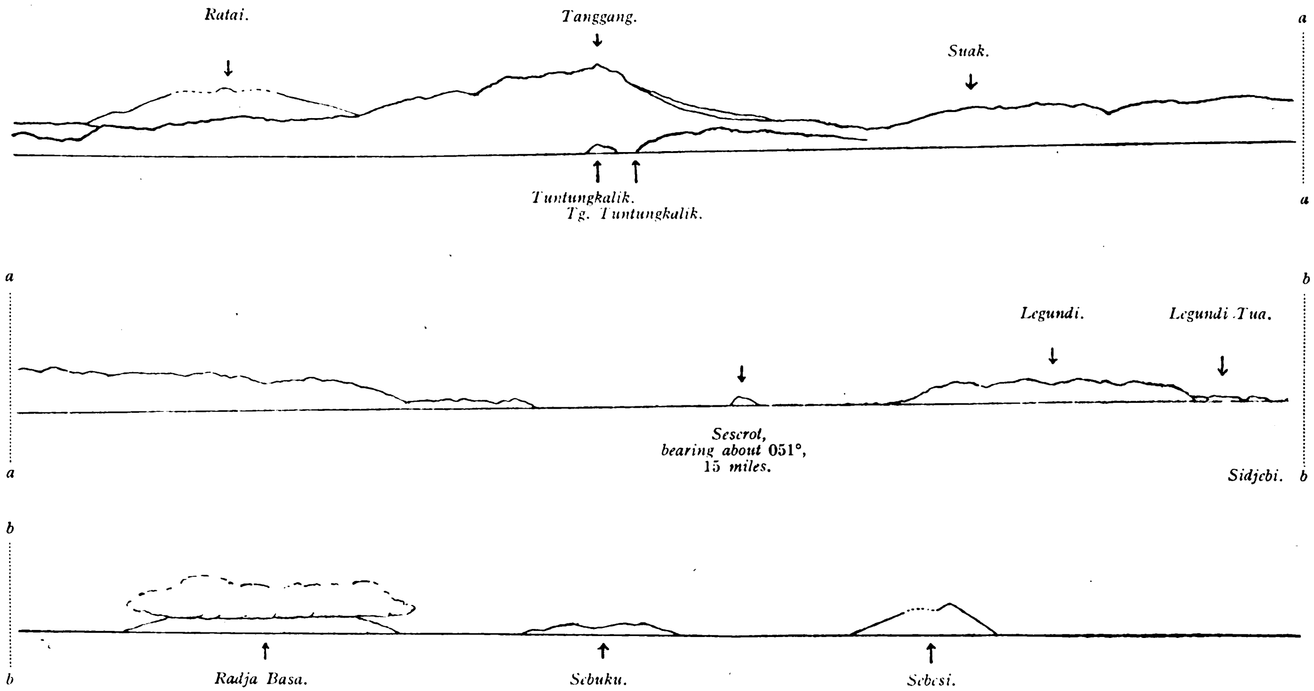
A bank of sand, with depths of from 6 to 20 fathoms ($11^{m}0$ to $36^{m}6$) over it, extends about 7 miles south-westward from the island, and affords good anchoring ground. The south-west-going stream, which runs with great force along the north-western and southern sides of the island, causes heavy tide-rips there; an eddy, which sets very strongly inshore, is then formed in the bay on the south-western side. The depths in this bay are very irregular.

Stroom klip lies about 2 miles north-north-westward of the western extremity of Sangiang, is just above water and is always marked by breakers; there is deep water on all sides at a distance of about 3¼ cables from the rock. Sometimes strong eddies and discoloured water in the vicinity of this rock makes it appear as though it were joined to Sangiang by a ridge, although such is not the case. A stream with a rate of 6 knots, had been observed abreast Stroom klip.

Winsor klip, about 4 miles north-eastward of the northern extremity of Sangiang, has a least depth of 3 fathoms ($5^{m}5$) over it, and is marked by discoloration and tide-rips; it is steep-to within a distance of a

Charts 1653a, 941a, 1263.

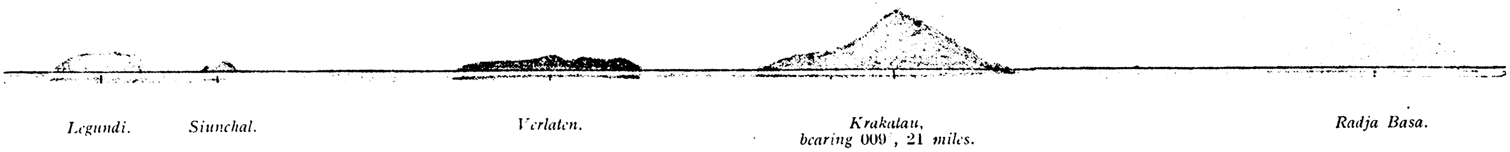
To face page 62.



View, in three parts, of south coast of Sumatra, from the entrance to Semangka baai.

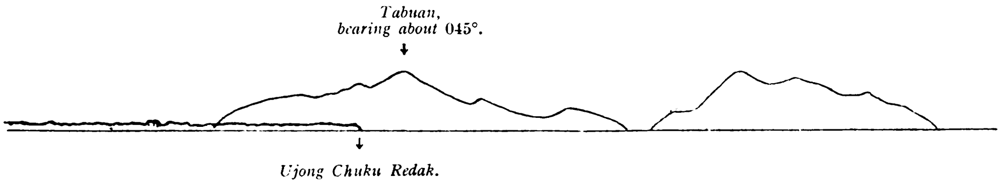
(Original dated 1929.)

To face page 63.



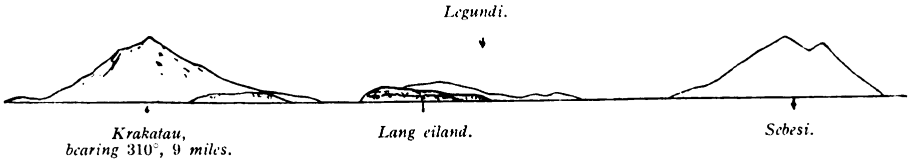
Islands in Sunda strait.

(*Original dated* 1902.)



Sumatra, south coast. Tabuan from south-westward.

(*Original dated* 1929.)



Krakatau and adjacent islands.

(*Original dated* 1929.)

Chart 2056.

quarter of a cable. The whole of Merak besar open on either side of Toppershoedje will lead close on one side or the other of this danger.

Toppershoedje (Toppers island) (*Lat. 5° 54′ S., Long. 105° 56′ E.*), about 5 miles east-north-eastward of the northern extremity of Sangiang, is a steep rock, 230 feet (70^{m}1) high, covered with vegetation; there is deep water at a distance of 3 cables all round.

A light is exhibited, at an elevation of 251 feet (76^{m}5), from a white iron framework structure, 72 feet (21^{m}9) in height, on Toppershoedje.

NORTH-WESTERN SIDE OF SUNDA STRAIT.—Coast.— The south coast of Sumatra, which forms the north-western side of Sunda strait, from Vlakke hoek on the west to Tanjong Tua (Varkens hoek) on the east, a distance of 70 miles, consists of three large promontories, between which are Semangka baai and Lampung baai.

Of these three promontories the western, known as Benkulen peninsula, is the lowest; it is traversed almost throughout its length by the Barisan gebergte and terminates in low land southward.

On the central promontory high mountains rise steeply from the sea abreast the Legundi eilanden, and, extending in a general north-westerly direction, eventually enclose the valley of Wai Semangka, which, with Wai Ngarip, flows into the head of Semangka baai, between them and the Barisan gebergte. On the mountain range of the central promontory are several high volcanoes: Tanggang, near the southern extremity, and about 36 miles east-north-eastward of Vlakke hoek, is 3,812 feet (1,161^{m}9) high; Tanggamus, about 31 miles north-north-eastward of Vlakke hoek, is described on page 53. On the eastern part of the central promontory are Pesawaran, 5,453 feet (1,662^{m}1) high, and Ratai, 5,518 feet (1,681^{m}9) high, lying close to one another, about 12 miles northward of Tanggang. *See* view facing page 62.

The eastern promontory is highest in the southern part, where the double-peaked volcano Radja (Raja) Basa, 9½ miles north-westward of Tanjong Tua, is 4,203 feet (1,281^{m}1) high, and rises steeply from the sea. *See* also page 71.

The entire south coast of Sumatra is thickly wooded, with villages here and there along the coast.

Off-lying island.—Betua, known by the Dutch as Klein Fortuin, an island about 6½ miles westward of Vlakke hoek, is low, wooded with high trees, and fringed by a reef, which extends about 6 cables from the north-western and south-eastern ends; this reef is prolonged by a narrow ridge, with depths of less than 10 fathoms (18^{m}3) over it, which extends about 3 miles farther south-eastward. *See* view facing page 54.

Anchorage may be obtained, in depths of from 8 to 9 fathoms (14^{m}6 to 16^{m}5), off the north-eastern side of the island, where there is a village.

Coast.—Light.—Vlakke hoek is entirely flat and is fringed by a narrow coral reef, outside which the depths increase fairly regularly. Three patches, with depths of from 7 to 10 fathoms (12^{m}8 to 18^{m}3) over them, lie near the 20-fathom (36^{m}6) line, about 5 miles south-westward of the cape.

Approaching Vlakke hoek in thick weather, when the land cannot

Charts 1653a, 941a, 1263.

be seen, the soundings are a good guide, but it is advisable to keep in depths of not less than 20 fathoms ($36^{m}6$).

A light is exhibited, at an elevation of 205 feet ($62^{m}5$), from a white iron tower with a dwelling, 190 feet ($57^{m}9$) in height, on Vlakke hoek. In certain weather conditions, the lighthouse is reported to be difficult to distinguish on account of its colour and slimness.

The coast between Vlakke hoek and Ujong Chuku Redak, a low point 10½ miles eastward, is low in the western part but becomes slightly higher eastward. A reef, with a depth of 5 feet ($1^{m}5$) over it and marked by breakers, lies one mile offshore and 2¾ miles east-south-eastward of Ujong Chuku Saleman, a low point 2 miles south-eastward of Vlakke hoek. There is a patch with a depth of 4¾ fathoms ($8^{m}7$) over it about half a mile south-south-westward of Ujong Chuku Saleman (*Lat. 5° 57′ S., Long. 104° 35′ E.*); and a patch, with a depth of 6 fathoms ($11^{m}0$) over it, lies about 3 miles southward of the same point, otherwise there are no dangers along this part of the coast.

Semangka baai.—Semangka baai, entered between Ujong Chuku Redak and Tanjong Tuntungkalik, 23 miles east-north-eastward, is entirely open to south-easterly winds, and, when these are blowing, only affords anchorage in the northern part. The western shore is steep-to, with depths of from 20 to 30 fathoms ($36^{m}6$ to $54^{m}9$) within half a mile of it; the eastern side is less steep, and affords opportunity for anchoring, as the depths are from 20 to 30 fathoms ($36^{m}6$ to $54^{m}9$) at 2 miles offshore.

Tabuan, an island, nearly in the middle of the entrance of the bay, is thickly wooded and steep on all sides, rising to a peak, 2,205 feet ($672^{m}1$) high; Tanjong Batu Kebuchung, its south-eastern extremity, lies 9 miles north-eastward of Ujong Chuku Redak. Except on the northern side it is fringed by a steep-to reef, but on the south-eastern side a ridge, with depths of less than 20 fathoms ($36^{m}6$), coral and sand, over it, extends 2½ miles eastward. There is anchorage on the northern side, off Kampong Sawangbalak, and on the south-eastern side of the above-mentioned ridge. *See* view facing page 63.

South-western side of Semangka baai.—Anchorages.—Tampang baai, entered between Ujong Chuku Redak and Ujong Chuku Batu Lunik, 6 miles northward, is entirely open to south-easterly winds, but affords good anchorage, in a depth of 14 fathoms ($25^{m}6$), sand, north-eastward of Kampong Tampang, situated near the head of the bay. The village is difficult to distinguish from seaward, but the coconut trees give some indication of its position. There is a sandy beach along the shore of the bay.

There is anchorage off Kampong Kaurgading, about 8 cables northward of Ujong Chuku Batu Lunik, in a depth of 10 fathoms ($18^{m}3$), about 2 cables offshore, with a house with a zinc roof, bearing 258°. Ujong Gunung Dalam is a high point about 7 miles north-north-westward of Ujong Chuku Batu Lunik. There is anchorage off Kampong Karangberak, on the southern side of the point, in a depth of 18 fathoms ($32^{m}9$), about 2¾ cables offshore. Good anchorage can be obtained off Kampong Wainipah, 10 miles north-westward of Ujong Gunung Dalam, in a depth of 11 fathoms ($20^{m}1$); a vessel should approach by sounding, with the low point immediately northward of the village bearing about 316°. Coral reefs extend about half a mile

Chart 2056.

offshore between the village and Tanjong Betung, a low point about 2¼ miles north-north-westward.

Kampong Betung, one of the largest villages on the western shore of the bay, is situated on the northern side of Tanjong Betung (*Lat. 5° 33′ S., Long. 104° 33′ E.*) and there is anchorage, in a depth of 17 fathoms (31^{m}1), about 1½ cables offshore, with the village bearing about 240°; rocks above water and discoloured water extend one cable offshore. Kampong Tandjungan (Tanjungan) stands just eastward of the southern mouth of the Wai Semangka and about one mile north-westward of Kampong Betung; a hard sandbank lies off the northern mouth. There is good anchorage off Kampong Tandjungan, in a depth of 14 fathoms (25^{m}6), about 7 cables offshore, with the village bearing about 230°. The land at the head of the bay is low, marshy, and covered with high trees.

Rede Kota Agung.—Light.—Anchorage.—Kota Agung, the headquarters of a Government official, is situated on the beach at the head of Semangka baai, about 5½ miles north-eastward of Tanjong Betung.

A light is occasionally exhibited, at an elevation of 28 feet (8^{m}5), from a white iron framework structure, 26 feet (7^{m}9) in height, near the root of the pier at Kota Agung.

There is anchorage, in a depth of 5 fathoms (9^{m}1), mud and sand, with the light-structure bearing 024°, distant nearly half a mile; a 2-foot (0^{m}6) patch lies about one mile west-south-westward of the light-structure, so it is advisable to steer up to the anchorage on the above bearing. A flagstaff behind the village is a useful mark.

The coastal reef extends about 1¾ cables from the point situated about 4 cables south-eastward of the light-structure, and shelters the beach fairly well from the south-easterly swell, so that landing can always be effected. In the west monsoon the anchorage is unsuitable for small vessels, which should then anchor off Kampong Tandjungan.

Kota Agung is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij.

North-eastern side of Semangka baai.—Danger.—Eastward of Kota Agung (*Lat. 5° 30′ S., Long. 104° 37′ E.*) the spurs from the mountains approach the coast, which rapidly becomes steep and rocky. In the places where the mountains are intersected by valleys, there are usually bays and villages, although the latter frequently lie some distance inland and are not visible from seaward; usually, however, coconut trees indicate their whereabouts. The coast north-westward of Labuan Tengor, situated about 19 miles south-eastward of Kota Agung, may be approached fairly closely, except in the vicinity of Tanjong Balang Besi, 7½ miles east-south-eastward of Kota Agung, where a reef, which dries, extends about 2¾ cables, and near the mouth of the Wai Limau, about 5½ miles farther south-eastward, where a rocky bank extends half a mile offshore. A dangerous coral reef, with a depth of 2 fathoms (3^{m}7) over it, and not marked by discoloration, lies about 1½ miles southward of the mouth of the Wai Limau.

South-eastward of Labuan Tengor the coast is fronted by numerous steep rocks and islets. Labuan Tengor is only suitable for small vessels with local knowledge, and does not afford good anchorage, as the swell runs direct into the bay.

There is usually surf along the entire north-eastern shore of Semangka

Charts 1653a, 941a, 1263.

Chart 2056.

baai, becoming heavier towards Sunda strait, owing to which the atmosphere is very hazy in the mornings, and the coast is very difficult to distinguish. Tanggamus (page 53) at the head of the bay, the summit of Tabuan, which appears sharp from north and south, and the steep, rocky islets Hiu and Tuntungkalik, lying off the bays of Kalumbayan and Kiluan (*see* below), respectively, can always be identified.

Telok Umbar, entered about 4½ miles south-eastward of Labuan Tengor, affords anchorage for small vessels, with local knowledge, although it is exposed to the southerly swell. Two steep, rocky islets, covered with vegetation, lie close offshore westward of the entrance, and there are some rocks above water just within the western entrance point; some rocks, which can be passed close-to, also lie close southward of the eastern entrance point. A vessel should enter the bay in mid-channel. Umbar village stands in the north-eastern corner of the bay.

Telok Paku, immediately south-eastward of Telok Umbar, is only suitable for praus; there is always a disturbed sea in it, with shelter only near its head. Paku, an islet (*Lat. 5° 43′ S., Long. 104° 59′ E.*) in the middle of the entrance, is a useful point of identification. Close eastward of this islet is a hollow rock, named " Batu Nyerbo " (spouting rock) by the natives, from which water spurts upwards like a fountain when there is a heavy swell, having the appearance of a white sail when seen from a distance.

Telok Kalumbayan, entered about 2 miles south-eastward of Telok Paku, can be readily identified by Hiu, a steep, rocky islet, 492 feet ($150^{m}0$) high, covered with vegetation, which lies 6½ cables south-westward of Tanjong Laguan, the south-eastern entrance point. About half a mile north-westward of Hiu is Batu Kabulung, and about 3 cables eastward is Batu Kabu. The passages between these three islets and the coast are clear of dangers; if passing through them a vessel should always keep Batu Laguan, some rocks close westward of Tanjong Laguan, well on her starboard hand. Kampong Napal and Kampong Kalumbayan, at the head of the bay, are not visible from seaward.

A vessel proceeding into Telok Kalumbayan should pass northward of Batu Kabulung, and can obtain anchorage, in a depth of about 9 fathoms ($16^{m}5$), about 2 cables offshore, in the north-eastern corner of the bay.

Tanjong Baru lies about three-quarters of a mile south-south-eastward of Tanjong Laguan. Telok Karang Berak and Telok Pegadungan, entered about 7 cables and 2¼ miles east-south-eastward, respectively, of Tanjong Baru, are too exposed to afford anchorage.

Telok Kiluan, on the northern side of Tanjong Tuntungkalik, and about 4½ miles east-south-eastward of Tanjong Baru, affords, after Telok Kalumbayan, the best anchorage at the entrance to Semangka baai, although there is little room to swing; vessels lie here sheltered from all winds. The steep rocky islet Tuntungkalik, lying about 2½ cables south-westward of Tanjong Tuntungkalik, the southern entrance point, is a good landmark. Kiluan, an islet, with some large rocks above water extending 5 cables south-westward from its south-western extremity, lies in the middle of the entrance. A coral reef, which dries, extends about 1¼ cables from the northern shore of the

Charts 1653a, 941a, 1263.

Chart 2056.

bay; a small detached reef, which dries, at the head of the bay, is usually marked by discoloration.

To enter the bay, a vessel should pass southward of the rocks off the south-western extremity of Kiluan, and then steer in mid-channel between that islet and the south-eastern shore of the bay; thence keep close along the steep point eastward of Kiluan (*Lat. 5° 47′ S., Long. 105° 06′ E.*), and anchor by eye, taking care to give the reef extending from the northern shore of the bay a good berth. There are some houses near the head of the bay, but they are not visible from the anchorage.

Coast.—The coast between Tanjong Tuntungkalik and Tanjong Tikus, 8 miles eastward, is steep, inaccessible, and affords no anchorage. It is fringed by numerous rocks and islets, but these all lie close inshore except the Tudjuh (Tuju) eilanden, which extend about 6 cables south-westward of Tanjong Berak, situated about 2¼ miles eastward of Tanjong Tuntungkalik; and Batu Belantung, a steep-to rock which dries, and is only occasionally marked by breakers, lying about 4½ cables offshore and nearly one mile westward of Tanjong Belantung, the western entrance point of Peper baai. Belantung, a very prominent rocky islet, lies about midway between Batu Belantung and the coast.

Peper baai, entered between Tanjong Belantung and Tanjong Tikus, about 1½ miles east-north-eastward, has a noticeable steep group of rocks in the middle, with some others close off its western shore. There is nearly always a turbulent sea in the bay, but when there is little swell landing can be effected in a small cove with a sandy beach northward of Tanjong Belantung (*Lat. 5° 48′ S., Long. 105° 12′ E.*).

The eastern extremity of the peninsula separating Semangka baai and Lampung baai is named Ujong Chuku Chapah.

Legundi eilanden.—Dangers.—Anchorages.—Legundi eilanden, on the western side of the entrance to Lampung baai, consist of six islands, named Legundi, Seserot, Unang Unang, Legundi Tua, Siunchal and Sidjebi (Sijebi). They are all densely wooded and hilly, and are mostly fringed by very narrow reefs, which are very steep-to on their southern sides. The straits between the various islands are not recommended for large vessels. *See* views facing pages 62, 63.

Legundi, the largest of the group, is 1,125 feet ($342^{m}9$) high. Two prominent rocks, covered with vegetation, lie within 2½ cables south-westward of Ujong Pamuchukan, the south-western extremity of the island. There are two bays on the northern side of the island, which afford very good anchorage, entirely sheltered from westerly and south-easterly winds. Labuan Agung, the western of these, is clear of dangers, and its western entrance point lies about 1½ miles north-eastward of Ujong Pamuchukan; vessels can anchor about 1¾ cables offshore, with the south-western entrance point in line with the south-western extremity of Seserot, bearing about 331°. There is a small village at the head of the bay. The north-eastern entrance point of Labuan Agung forms the western entrance point of Labuan Kramat, the eastern bay, which is somewhat narrow, whilst the space is further restricted by the rocky islet Pertapaän, partly planted with coconut trees and lying in the middle of the bay. Unang Unang, also partly wooded with coconut trees, lies off the entrance to the bay and about three-quarters of a mile west-south-westward of Ujong Chuku Tiram (*Lat. 5° 47′ S., Long. 105° 18′ E.*), the northern extremity of Legundi;

Charts 1653a, 941a, 1263.

Chart 2056.

it is fringed by a reef, extending about one cable from its eastern side, and there are some rocks close off its south-western extremity. Two reefs, with depths of 10 and 5 feet ($3^{m}0$ and $1^{m}5$) over them, respectively, lie about 1¾ and 3 cables southward of Unang Unang; there is a 5-fathom ($9^{m}1$) patch between the southern of these two reefs and the western entrance point of Labuan Kramat. Making for the anchorage, a vessel should steer for Pertapaän, bearing 146°, until past the western entrance point where the bay is well open; thence in mid-channel westward of Pertapaän, anchoring in a depth of about 9 fathoms ($16^{m}5$), about 1½ cables from the coastal reef, with the western side of Pertapaän in line with the eastern side of Unang Unang, bearing about 011°. The anchorage can also be reached by passing eastward of Unang Unang, bearing in mind that the coastal reef extends about one cable eastward from Unang Unang, and the same distance north-eastward from Pertapaän. There is a small village at the head of the bay. There is also anchorage off the east coast of Legundi in Straat Siunchal (*see* below), close northward of the steep rock Higo (*see* below); there are some huts abreast this anchorage.

Siunchal, the next island eastward of Legundi, is 459 feet ($139^{m}9$) high at its southern end, and almost entirely covered with coconut trees. During the west monsoon there is safe anchorage in Telok Kedah, a bight on the east coast, keeping at least 1¼ cables offshore. A reef, which dries, lies about half a cable offshore southward of the northern entrance point of the bight; this point is situated about 7 cables south-south-eastward of Kapala Siunchal, an islet close off the northern extremity of Siunchal. There is a village where fowls, eggs and bananas can be obtained.

Straat Legundi.—Danger.—Straat Legundi, between the Sumatra coast and Legundi eiland, is deep and clear of dangers; it is frequently used by vessels from westward, bound for Pandjang (Panjang) harbour, known by the Dutch as Oosthaven, at the head of Lampung baai. The high, steep islet Seserot, lying in the middle of the strait, can be passed on either side; a rock, which dries, lies about 1½ cables southward of the south-western extremity. The tidal streams are weak, setting north-eastward with the rising water, and south-westward with the falling water. There is usually a south-easterly swell.

Medusa, a coral reef, with a least depth of 2¾ fathoms ($5^{m}0$) over it, lies off the north-eastern entrance to Straat Legundi and about 2 miles north-eastward of Seserot; it is sometimes marked by discoloration and usually by ripples, but it never breaks and is very dangerous to navigation.

Straat Siunchal.—Straat Sidjebi.—Straat Siunchal, between Legundi (*Lat. 5° 49′ S., Long. 105° 16′ E.*) and Siunchal, is deep and clear of dangers. Legundi Tua, a steep, high island covered with vegetation, is situated off the southern entrance and 3 cables south-eastward of the south-western extremity of Siunchal, and may be approached closely everywhere. A steep rock lies at the northern end of the passage between Legundi Tua and Siunchal, and may be passed closely on either side. Higo, an islet connected to the eastern side of Legundi by a reef, about 1½ miles south-eastward of the northern extremity, is steep, high, and covered with vegetation, and can be approached close-to. Batu Karbau, just above water, with the upper part white with seabirds' droppings, lies off the southern entrance to

Charts 1653a, 941a, 1263.

Chart 2056.

the strait and about three-quarters of a mile south-eastward of Legundi Tua; it is steep-to, with great depths around. In Straat Siunchal the stream sets in the direction of the strait, the maximum rate observed was 1½ knots.

Straat Sidjebi, between Siunchal and Sidjebi, which latter lies about 4 cables eastward of the south-eastern end of Siunchal, is only suitable for small vessels with local knowledge; there are several rocks which dry in this strait. Sidjebi, 354 feet ($107^{m}9$) high, is almost entirely covered with coconut trees, and there are some huts on the eastern side. The southern part of the island is the highest; the northern part terminates in a narrow, sandy tongue of land.

Serdang.—Serdang (*Lat. 5° 49′ S., Long. 105° 24′ E.*), about 2¾ miles eastward of Sidjebi, with a clear channel between, is a high steep rock covered with brushwood; a sunken rock lies near its north-western extremity.

LAMPUNG BAAI.—Lampung baai is entered between Tanjong Tikus and Tanjong Kelapa, about 23 miles eastward. Tanggang, a mountain about 8½ miles north-westward of Tanjong Tikus, and Ratai, about 12 miles northward of Tanggang, are described on page 63; spurs from these mountains descend to the coast, forming a number of bays with many good anchorages, although there are numerous dangers. The western shore is marshy in places, and there are some fairly large villages, though these are seldom visible from seaward; the eastern shore is generally high and steep-to. Wai Ratai (page 71), which flows into Ratai baai, on the western shore, is the largest river, but none of them is of any importance to shipping. *See* view facing page 62.

Western side of Lampung baai.—Besides Tanggang and Ratai mentioned above, the following on the western side of the bay are noticeable from seaward:—Dandar, a hill, 564 feet ($171^{m}9$) high, situated on the northern side of Ratai baai and about 12½ miles northward of Tanjong Tikus; and the summits of the islands Puhawang, Kelagian, Tegal, and Tangkil, which all lie close off the western shore, in addition to the Legundi eilanden.

Pedada baai is entered between Ujong Chuku Chapah (page 67) and the southern extremity of Ujong Chuku Chambai, about 3 miles northward, and affords good anchorage. A rock, which dries and is marked by breakers, lies about one cable northward of the northern extremity of Ujong Chuku Chapah. Off Ujong Chuku Chambai are the islands Tanjong Putus, Lalangga Balak, and Lalangga Lunik, partly or entirely planted with coconut trees; some rocks above and below water lie within half a mile eastward of the eastern extremity of Lalangga Balak, and some rocks above water extend about 2 cables westward from the same island. Tanjong Putus, 299 feet ($91^{m}1$) high, is separated from the main coast by a narrow channel, with a least depth of 3¾ fathoms ($6^{m}9$) in it. Lalangga Lunik is situated about 1½ miles eastward of the eastern extremity of Ujong Chuku Chambai (*Lat. 5° 44′ S., Long. 105° 13′ E.*).

The islets Balak, 266 feet ($81^{m}1$) high, Lok, and Lunik, also planted with coconut trees, lie in the western part of the bay.

The small rivers Bawang and Pedada, on which are the villages of Bawang and Kota Djawa (Jawa), respectively, flow into this part of the bay.

Charts 1653a, 941a, 1263.

Chart 2056.

There are several detached reefs in the bay, all marked by discoloration, the northern part being especially foul. A reef, with a depth of 1½ fathoms ($2^{m}7$) over it, lies in the middle of the entrance and about 1¼ miles eastward of Balak.

There is confined but very excellent anchorage in Telok Pagar, on the western side of Ujong Pengrangan (*Lat. 5° 46′ S., Long. 105° 12′ E.*), on the southern side of the entrance to Pedada baai ; two rocks above water lie close northward of this point, and can be passed close-to. The coastal reef projects about one cable from the western shore of Telok Pagar. There is also good anchorage about 1½ miles farther westward in Telok Benuangan ; a small detached reef lies in the south-eastern corner of this bay, and the coastal reef extends about 3½ cables northward from the south-western side with a small islet on its extremity. Anchorage can be obtained anywhere westward of Balak, and also in the northern part of Pedada baai, although, as previously mentioned, there are a number of reefs in this part. These anchorages should only be used by vessels with local knowledge.

Puhawang, which has a very prominent steep summit, 797 feet ($242^{m}9$) high, in the north-eastern part, lies about 1¾ miles northward of the eastern extremity of Ujong Chuku Chambai. Puhawang village stands on the northern side of the island. Puhawang Lunik is connected to the eastern side of Puhawang by a reef which dries.

Punduh baai, westward of Puhawang, has a marshy coast. Wai Punduh flows into the southern part of the bay, and has formed a continually increasing mudbank off its mouth ; there are several villages on the river, and these are connected to the bay by a wide road. A shed stands where this road meets the coast.

There is anchorage, in depths of from 5 to 6 fathoms ($9^{m}1$ to $11^{m}0$), about 2¾ cables north-eastward of this shed, and, although somewhat hot, it is free from mosquitoes ; a reef, which dries, and always plainly marked by discoloration, lies east-south-eastward of the anchorage. As the passage southward of Puhawang is full of dangers, this anchorage should be approached by the passage northward of that island, which is easy to navigate by vessels with local knowledge ; a reef, with a depth of 1¼ fathoms ($2^{m}3$) over it, lies in the northern entrance of this channel, about half a mile north-north-westward of the northern extremity of Puhawang, and there is a reef, with a depth of 2 feet ($0^{m}6$) over it, always marked by discoloration, off the north-western coast of this island. A reef, which dries, lies about 1¼ miles westward of the northern extremity of Puhawang (*Lat. 5° 40′ S., Long. 105° 13′ E.*).

Off-lying danger.—A sandbank, which dries with depths of 13 fathoms ($23^{m}8$) close around it, is situated about 1¾ miles north-eastward of Puhawang Lunik ; it is always marked by ripples at high water.

Ratai baai.—Dangers.—Ratai baai, just northward of Punduh baai, is the largest and most important of the bays on the western side of Lampung baai. Kelagian is an island, 925 feet ($281^{m}9$) high, lying 6 cables north-eastward of the southern entrance point, and there is a clear channel into the bay on either side of it. A small islet, with a reef, which dries, extending about one cable from its eastern side, lies close off the southern side of Kelagian. There is a reef, with a depth of 1½ fathoms ($2^{m}7$) over it, about 1¾ cables off the south-eastern extremity of the same island. In the bay itself there are no

Charts 1653a, 941a, 1263.

Chart 2056.

dangers except Gosong Mawing, two reefs, which dry, which lie within half a mile of the north-western extremity of Kelagian, and which are always marked by discoloration. Maitem, an islet, about 1¾ miles north-eastward of the northern extremity of Kelagian, lies off Ujong Chuku Chentiga, the northern entrance point of the bay; there is a passage for praus between this islet and the coast, but there is a pinnacle rock, with a depth of 3 feet (0^{m}9) over it, in the middle.

There is anchorage, free from mosquitoes, off Kampong Piabung, near the head of the bay and on its south-western side, in a depth of about 7 fathoms (12^{m}8), about three-quarters of a cable offshore. There is a small pier here, suitable for lighters. A few provisions may be obtained. Wai Ratai, an unimportant river, discharges into the head of the bay, and off its mouth is a mudbank. There are several villages, connected by a good road, on the northern shore of the bay.

Coast.—Dangers.—The coast northward of Ratai baai, between Ujong Chuku Chentiga and Tanjong Tambikil (*Lat. 5° 31′ S., Long. 105° 16′ E.*), about 4½ miles northward, is alternately hilly and marshy, and is fringed by an extensive coral reef. Tegal, an island, 385 feet (117^{m}3) high, lying about one mile offshore, and about 2 miles north-eastward of Maitem, is entirely covered with coconut trees; there is a bay on the eastern side of Tegal, where small vessels with local knowledge can anchor. A reef, with a sandbank above water on its western side, lies between Tegal and the coast westward; there is a narrow but deep channel on either side of this reef.

Eastern side of Lampung baai.—Dangers.—The coast between the eastern entrance point of Lampung baai, and Kaliandak village, about 5½ miles northward, is fringed by a reef, with rocks above water in places; owing to the heavy surf, landing on this coast is dangerous with westerly winds. There are several villages, and behind them rises Radja Basa, with two summits, the south-eastern of which is named Barilang (*see* also page 63); Radja Basa is prominent when seen from the Java sea, but not from Lampung baai. Anchorage may be obtained off Kampong Chanti, about 3½ miles southward of Kaliandak, in a depth of 8 fathoms (14^{m}6), mud, with the southernmost of the Tiga eilanden (page 78) bearing 236°.

Chart 2056, plan of Kaliandak road.

Rede Kaliandak.—Light.—Danger.—Anchorage may be obtained, in a depth of 6½ fathoms (11^{m}9), mud, in Rede Kaliandak, with the flagstaff, at the root of the pier, in line with the head of the pier, bearing 112°.

A rock, which dries, lies 3½ cables north-westward of the pier-head and about 3 cables offshore.

A light is exhibited, at an elevation of 47 feet (14^{m}3), from a white iron framework structure, 43 feet (13^{m}1) in height, on the pier-head when a vessel is expected or leaving the roadstead.

Hot springs rise among the rocks near the village.

The roadstead is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij.

Prohibited anchorage.—Two cables are landed at a cable house southward of Kaliandak village; anchorage is prohibited within a quarter of a cable of these cables.

Chart 2056.

Coast.—Dangers.—The coast between Kaliandak and Belantung

Charts 1653a, 941a, 1263.

Chart 2056.

baai, about 3½ miles north-westward, is low and is fringed by a white sandy beach. Belantung baai, although free from dangers, affords no sheltered anchorage. A reef, with a depth of 1½ fathoms (2^m7) over it, is situated about 2 cables south-eastward of Ujong Chuku Belantung, the western entrance point, and a rock which dries, lies about 7 cables southward of the eastern entrance point. There are two small villages on the western shore of the bay.

The coast between Belantung baai and Telukbetung, about 20 miles north-westward, is high and fringed by a steep-to coastal reef, on which the sea breaks heavily with westerly winds; except for the reefs northward and eastward of Chendung eilanden, there are no dangers along this part of the coast.

Chendung eilanden, about 7 miles south-south-eastward of Telukbetung (*Lat. 5° 27′ S., Long. 105° 16′ E.*), consist of the three islets Chendung Laut, Sulah and Darat. Sulah, the northernmost, is a high, steep rock; the other two are lower. A reef, with a depth of 3 fathoms (5^m5) over it, lies about three-quarters of a mile north-north-westward of Sulah and about one mile offshore, and some reefs lie between Darat and the coast about one mile eastward.

Chart 3611, plan of Telukbetung road.

Head of Lampung baai.—Light.—Islets and dangers.—The western side of the head of Lampung baai, between Tanjong Tambikil and Telukbetung, about 4 miles northward, is encumbered with islets, reefs and sandbanks. Tangkil, an islet, 187 feet (57^m0) high, covered with coconut trees, lies about half a mile north-eastward of Tanjong Tambikil; there is a clear channel between Tangkil and the coast westward. Kubur, an islet, 85 feet (25^m9) high, is situated nearly 2 miles northward of Tanjong Tambikil, and Pasaran, a low islet, lies about 1½ miles farther northward. Pamanggutan, a bank of sand, coral and stone, about half a mile north-eastward of Kubur, covers entirely at high water. There are several other reefs in this vicinity, and their positions can be seen best on the chart.

A light is exhibited, at an elevation of 57 feet (17^m4), from a white iron beacon, on a reef lying about 6 cables east-south-eastward of Pasaran (*Lat. 5° 28′ S., Long. 105° 16′ E.*).

Rede Telukbetung.—Buoy.—Telukbetung, the principal town and seat of Government for the Lampung district, is situated on the north-eastern side of the mouth of Wai Kuripan, which flows out about 4 cables northward of Pasaran. On the eastern side of the town is Kunyit, a hill, 315 feet (96^m0) high, shaped like a sugarloaf. Nearly all the trade is now carried out at Pandjang (Panjang), known by the Dutch as Oosthaven, on the eastern side of the head of Lampung baai, so that Rede Telukbetung is only used by small vessels, which anchor as close as possible off Pasaran. There are warehouses on the left bank of Wai Kuripan; this river can only be entered by praus at high water, and at low water goods are carried ashore by wading over a hard sandbank fronting the mouth.

A red conical buoy is moored about 9 cables south-south-eastward of Kunyit.

Scarcely any stream is perceptible in the roadstead, and vessels always lie to the wind. Telukbetung is connected with the general telegraph system.

Pandjang harbour.—Light.—Beacon.—Buoyage.—Depths.—

Charts 2056, 1653a, 941a, 1263.

Chart 3611, plan of Telukbetung road.

Pilots.—Pandjang (Panjang) harbour, known by the Dutch as Oosthaven, formed by a natural breakwater of sand and coral, has general depths of from 5 to 7 fathoms ($9^{m}1$ to $12^{m}8$) in it, and is available for large vessels. As the entrance, which has a least depth of 40 feet ($12^{m}2$) over a width of three-quarters of a cable, lies on the northern side, the harbour is completely sheltered. In 1945, a shoal was reported to lie in the approach to the harbour, about 8 cables north-westward of the light-structure at the prau quay, described below. Pandjang (Panjang) station (*Lat. 5° 29′ S., Long. 105° 19′ E.*), the terminus of the South Sumatra railway, is situated at the head of the harbour.

At the head of the harbour, near Pandjang station, there is a commercial quay, about 540 feet ($164^{m}6$) long, with a depth of about 26 feet ($7^{m}9$) alongside, connected to the railway, and there are several mooring buoys near it. North-eastward of this quay is a pier, about 246 feet ($75^{m}0$) in length, with a least depth of 26 feet ($7^{m}9$) alongside, and further north-eastward is a quay for praus, about 330 feet ($100^{m}5$) in length, with a depth of about 7 feet ($2^{m}1$) alongside; there is a wooden pier projecting from this quay with a depth of about 20 feet ($6^{m}1$) alongside.

A light is exhibited, at an elevation of 29 feet ($8^{m}8$), from a white iron structure, 23 feet ($7^{m}0$) in height, on the prau quay at Pandjang.

A beacon, painted black and white, stands about 8½ cables north-north-westward of the above light-structure.

The northern end of the natural breakwater, on the western side of the harbour entrance, is marked on its western side by a white conical buoy, and on its eastern side by a conical light-buoy, painted white, exhibiting a *green group flashing* light showing a group of *three* flashes *every ten seconds.*

The edge of the reef on the eastern side of the harbour entrance is marked by a can light-buoy, painted black, exhibiting a *red flashing* light showing a *short* flash *every five seconds.*

A can light-buoy, painted black, exhibiting a *red fixed* light, marks the edge of shoal water on the north-eastern side of the inner part of the harbour.

The Harbour Master acts as pilot and there is also an Indonesian pilot available.

Provisions are obtainable, and water is laid on to the quay. There is a harbour doctor. Vessels of the Koninklijke Paketvaart Maatschappij carry out a regular service between Telukbetung and Pulomerak (page 61) in Java; the town is connected to the general telegraph system.

The submarine telegraph cable from Java is landed southward of Pandjang harbour (*Lat. 5° 28′ S., Long. 105° 19′ E.*).

Chart 2056.

NORTH-WESTERN SIDE OF SUNDA STRAIT (*continued*).—**Danger.**—Mengkudu and Sekepel are two islets lying close to the coast about 3¾ miles north-north-westward of Tanjong Tua (Varkens hoek) and are difficult to identify. Mengkudu is composed of light yellow sandstone, and has two hillocks, about 66 feet ($20^{m}1$) high, and covered with brushwood, near the extremities; a reef, with some rocks above water on it, extends about one cable from the western side,

Charts 2056, 1653a, 941a, 1263.

Chart 2056.

and a detached rock above water lies close off the southern extremity. Sekepel has a somewhat higher part on the southern side, also consisting of light yellow sandstone, and is entirely bare; it is fringed by a coral reef. There is usually a heavy swell off this part of the coast, but landing can be effected north-westward of Mengkudu. Abreast these islands the coast becomes lower, with hilly ridges sloping gradually down to Tanjong Tua.

Tanjong Tua (Varkens hoek) is a high, rocky, and wooded point, joined to the higher land behind by a low, bare ridge. Half a cable westward of the point is a rock above water. Close off the point are depths of 40 fathoms ($73^{m}2$). Approaching from westward the south-western extremity of Kandang Balak (page 75) appears from behind Tanjong Tua when the latter bears less than 077°; these two points and the southern extremity of Pandjurit, known by the Dutch as Hout eiland (page 75), all somewhat resemble each other when seen from westward. From eastward Tanjong Tua is easily identified.

Tims klip, about 1½ miles north-westward of Tanjong Tua, is small, but can be seen from a distance of about 3 miles; there are depths of from 16 to 27 fathoms ($29^{m}3$ to $49^{m}4$) close around the rock.

Chart 3611, plan of the Zutphen islands.

Between Tanjong Tua and Tanjong Bawang (*Lat. 5° 54′ S., Long. 105° 44′ E.*), about half a mile north-eastward, the coast forms a small bight fringed by a narrow reef, thence for half a mile north-eastward it is steep and rocky. From here it becomes more or less flat as far as Tanjong Sumur Batu, known by the Dutch as Steile hoek, about 5¾ miles north-eastward of Tanjong Tua, the mountains lying a little distance inland; it is fringed by a narrow coastal reef with some rocks on it.

The hilly islet Sindu lies close off the rocky Tanjong Gading, about 1¼ miles north-north-eastward of Tanjong Bawang. Fairly good anchorage may be obtained by vessels with local knowledge southward of this islet, in a depth of 3½ fathoms ($6^{m}4$), with the summit of Rimau Balak in line with the southern extremity of Sindu, bearing about 052°, and the southern extremity of Kandang Balak bearing 123°; this anchorage is open to the southerly swell, but in the east monsoon vessels lie here better than eastward of Pulau Sumur, known by the Dutch as the Zutphen eilanden. Pegantungan village is situated on a small river three-quarters of a mile northward of Tanjong Gading, but it is not visible from northward or southward. Gosong Pegantungan, a reef which dries, with a rock above water on it, lies about midway between the mouth of this river and Sindu; there are irregular depths of from 4¼ to 6 fathoms ($7^{m}8$ to $11^{m}0$) for nearly 4 cables eastward of this reef.

Tanjong Sumur Batu, known by the Dutch as Steile hoek, a high, prominent point, is formed by a spur running eastward from the saddle-shaped hill Panchong, which is 732 feet ($223^{m}1$) high; from north-eastward a separate summit appears to lie just within the point, and this is visible from 2 miles eastward of Mundu (Chart 2056), an islet about 1½ miles offshore and 10 miles north-north-eastward of Tanjong Sumur Batu. A coastal reef extends nearly half a cable from the point, with the 5-fathom ($9^{m}1$) line close outside. *See* view facing page 76.

Gosong Labuan, a small patch of drying reef with a rock above water

Charts 2056, 1653a, 941a, 1263.

Chart 3611, plan of the Zutphen islands.

on it, is situated about 4 cables north-north-eastward of Tanjong Sumur Batu and about 2 cables offshore. A 2¾-fathom ($5^{m}0$) patch lies about a quarter of a mile north-eastward of the same point. Kampong Sumur stands a little distance inland, about half a mile north-north-westward of the point.

In addition to Panchong, the following hills are noticeable: Sepan, a conical hill, 682 feet ($207^{m}9$) high, about half a mile westward of Panchong; Chikur, 824 feet ($251^{m}2$) high, 1¼ miles west-south-westward of Sepan, with a round summit covered with grass, which is very prominent owing to its light green colour, especially when the sun shines on it.

The east coast of Sumatra northward of Tanjong Sumur Batu is continued on page 83.

Pulau Sumur.—Pulau Sumur, known by the Dutch as Zutphen eilanden, are a group of four islands and a number of islets lying within 2½ miles of the Sumatra coast between Tanjong Tua and Tanjong Sumur Batu; most of the islands are high and for the greater part are densely wooded. The depths between the islands and reefs are very variable; the bottom is rocky and covered with sand. During the west monsoon the north-east-going stream may attain 4¾ knots between the islands and to eastward of them. The times of maximum stream are roughly the same as those in Sunda strait, *see* page 54. It is advisable to give the islands a berth of fully 1½ miles.

Kandang Balak, the south-western island, has two separate hills, the south-western, with a height of 322 feet ($98^{m}1$), being the higher; elsewhere the island is flat. The east coast is mostly rocky. Kandang Lunik, known by the Dutch as Hoog eiland, 315 feet ($96^{m}0$) high, lies close north-eastward of Kandang Balak, and has a narrow flat strip only on its northern and western sides. There is a bare rock southward of Kandang Lunik (*Lat. 5° 53′ S., Long. 105° 46′ E.*), named Pandjukut (Panjukut).

Gosong Tembulong besar and Gosong Tembulong kechil lie about 3¼ and 1¾ cables, respectively, off the north-western side of Kandang Balak.

Pandjurit, known by the Dutch as Hout eiland, 2½ cables south-eastward of Kandang Lunik, has a ridge of hills along its southern side, the summit being 299 feet ($91^{m}1$) high, terminating in a prominent point named Tanjong Karang Batang, the south-eastern extremity of the island. The southern coast and the western extremity are rocky; the northern and eastern coasts are flat.

Gebruders, two islets close together about 2½ cables northward of Kandang Lunik, and Kelapa, about 6 cables westward of them and about 2 cables off the Sumatra coast, are low. A dangerous reef, which dries, lies about 6 cables north-eastward of Kelapa.

Rimau Balak, the largest and highest of the Pulau Sumur, lies about 4 cables north-eastward of Gebruders and has three summits, the south-western having a height of 696 feet ($212^{m}1$) and being very noticeable. Gosong Barak, known by the Dutch as Boompjes rif, close off the south coast of Rimau Balak, dries at the eastern and western ends, and at high water some rocks still show.

Rimau Lunik, about 1¼ cables north-eastward of Rimau Balak, has a sharp summit at the north-eastern end. Tumpel and Kramat, in the channel westward of Rimau Balak (*Lat. 5° 51′ S., Long. 104° 47′ E.*), are low.

Charts 2056, 1653a, 941a, 1263.

Chart 3611, plan of the Zutphen islands.

Gosong Geni, which dries, lies about 2 cables northward of the northern extremity of Rimau Balak; there is a 4¾-fathom ($8^{m}7$) coral patch about 2½ cables westward of the same point. Gosong Gijang, which dries, is situated about 4 cables south-westward of the same point and 1¼ cables off the north-western coast of Rimau Balak. Gosong Pandang and Gosong Usumbra, both of which show even at high water, lie, respectively, about 3 cables southward and 4 cables south-south-eastward of Kramat; vessels using the channel between the Pulau Sumur and the Sumatra coast should pass eastward of the latter reef as Gosong Pandang is difficult to see at high water.

Owing to the strong currents, vessels are advised not to attempt the channel between the Pulau Sumur and the main coast; it is, however, easy to navigate by the chart, especially as some of the reefs have vegetation on them in places. The tidal streams run through this channel with a maximum rate of about 3 knots causing eddies off the reefs.

Chart 2056.

ISLANDS IN THE NORTHERN PART OF SUNDA STRAIT.

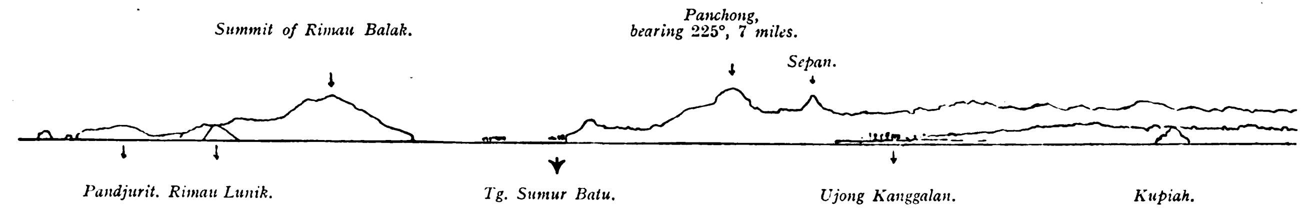
—**Krakatau.**—Krakatau is an island with an active volcano, 2,667 feet ($812^{m}9$) high, lying about 21 miles south-westward of Tanjong Tua (*Lat. 5° 55′ S., Long. 105° 43′ E.*); it was in eruption in the year 1680, and then remained in a state of quiescence for upwards of 200 years. In the year 1883, on 20th May the volcano burst out with great violence, accompanied by earthquakes, which were severely felt at Djakarta, and at the same time vast showers of pumice and ashes were projected to a great distance. The eruption was observed from the Imperial German ship *Elizabeth*, and on the following day, when 100 miles from Krakatau, a shower of dust was experienced which was estimated to become a layer one inch in thickness in 24 hours, and this was still falling when the vessel had gained a position 300 miles south-westward of Sunda strait.

On 26th August of the same year, Krakatau again burst into eruption, and it was of such a violent nature that miles of the coast on both sides of the strait were wholly devastated, and multitudes of people perished. On the 27th August, a succession of earthquake waves swept the shores of the strait, utterly destroying the towns of Anyer, Merak, Charingin, and Telukbetung, together with some of the lighthouses on both shores. This remarkable disturbance of the sea made itself felt in various parts of the world upon the same date, notably in Australia and South Africa, also at Karachi, in India.

The vast amount of pumice which lay upon the surface of the sea, in some places many feet in thickness, gave an appearance as if the ocean bed had appeared above water.

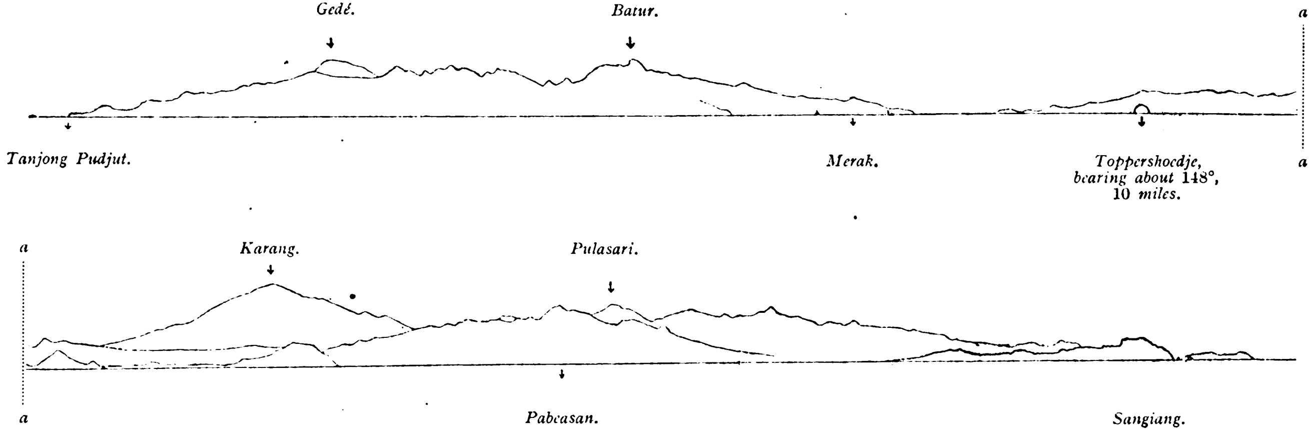
The steam from the volcano was estimated to have been driven to a height of more than 12 miles, and the rain of ashes fell over all southern Sumatra and northward to Singapore, eastward to Djakarta, and south-westward to the Cocos islands; finer particles of dust floating in the upper atmosphere enveloped the earth, and caused brilliant sunsets up to December of that year. The sound of the explosions was heard at Perth in Western Australia, in New Guinea, Ceylon, and the island of Mauritius.

Charts 1653a, 941a, 1263.



South-eastern extremity of Sumatra: Tanjong Sumur Batu and vicinity.

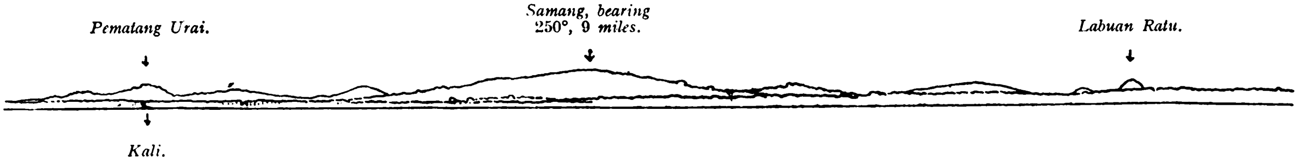
(*Original dated* 1929.)



View, in 2 parts, of the northern entrance to Sunda strait.

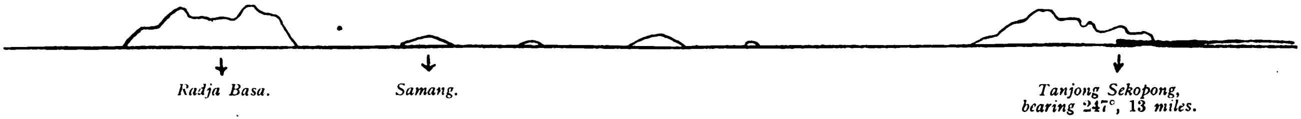
(*Original dated* 1929.)

To face page 77.



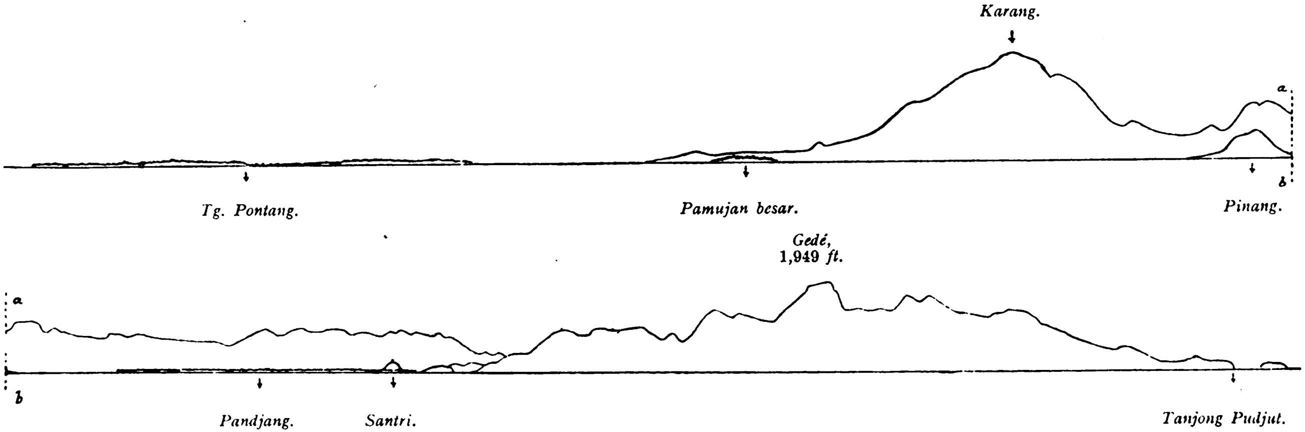
Coast of Sumatra, from south-eastward of Tanjong Penet.

(*Original dated* 1949.)



Coast of Sumatra, from north-eastward of Clifton bank.

(*Original dated* 1949.)



North coast of Java, from near island of Babi.

(*Original dated* 1949.)

Chart 2056.

The tidal wave, where obstructed, increased greatly in volume, and was observed at Toppershoedje (*Lat. 5° 54′ S., Long. 105° 56′ E.*), to rise 72 feet (22^{m}0) ; at Merak, between this island and the mainland, about 120 feet (36^{m}6) ; and from Tanjong Tua to Telukbetung the average height was about 80 feet (24^{m}4). Every object on the shore as far inland as the first range of hills, was levelled to the ground, and where the land was low the sea penetrated 5 miles inland. At Telukbetung the water rose to the square of the Resident's house, 118 feet (36^{m}0) above high water, and the Government steamer *Berouw* was swept over the pier into the Chinese quarter of the town, a distance of nearly 2 miles from the anchorage. The undulation was felt on the north coast of Java ; in Djakarta road the water rose 8 feet (2^{m}4), and in Tandjung Priok haven, on 27th August, from 1230 to 1330, it suddenly fell 18 feet (5^{m}5).

The island, for 100 feet (30^{m}5) up, remained a mass of glowing lava and stones ; all animal and vegetable life was destroyed, and it was five years before verdure again returned. Before the eruption, which completely destroyed that portion northward of the highest peak, the island was 5 miles by 3 miles in extent ; the northern side of the island now rises perpendicularly from the sea, and the remainder is covered with vegetation. *See* view facing page 63.

According to the official report, 36,417 persons perished, 37 of these being Europeans.

Danger signal.—In the event of threatened eruption of Krakatau volcano, Djakarta radio station will broadcast the necessary warning in Netherlands and English text.

Caution.—Owing to volcanic eruption, the area between Krakatau and Sebesi, about 10 miles northward, must be considered as unsafe, and routes outside this group should be taken by vessels. In 1928, Anak Krakatau, an islet, appeared midway between Verlaten and Lang eilanden, where formerly a bank with a depth of 15 fathoms (27^{m}4) was charted ; in 1929 this islet disappeared, but again came to the surface by eruptions in 1930, and, after heavy eruptions in February, 1933, appears to have increased in size. In 1935, this islet, almost circular in shape, had a diameter of about 4,000 feet (1,219^{m}2), and a height of about 206 feet (62^{m}8), and, in 1940, was 410 feet (125^{m}0) high. In 1948, there were a few casuarina trees on the northern extremity of the islet.

Verlaten and Lang eilanden.—Verlaten island, about 3½ miles north-westward of Krakatau, is also an active volcano, and is nearly three times larger in area than formerly. Lang eiland, about 1¾ miles northward of Krakatau, does not appear to have altered much, but the channel between it and Krakatau has widened considerably.

Bootsmans rots (Boatswains rock), 13 feet (4^{m}0) high, lies about three-quarters of a mile south-westward of Lang eiland, and rises perpendicularly from great depths.

Zee klip (Sea rocks), about 5 miles northward of Verlaten eiland (*Lat. 6° 06′ S., Long. 105° 23′ E.*), are two steep-to rocks about 30 feet (9^{m}1) high, lying close together, and can be seen from a great distance ; the southern and larger has a cleft in it, and the sea always breaks heavily on it.

Steers and Calmeyer reefs, with least depths of 1¼ and 3¼ fathoms (2^{m}3 and 5^{m}9) over them, respectively, are the highest parts of a great

Charts 1653a, 941a, 1263.

Chart 2056.

bank, on which the sea continually breaks, formed by the eruption of Krakatau and lying southward of Sebesi.

Sebesi and Sebuku.—Light.—Dangers.—Sebesi, about 7 miles northward of Lang eiland, appears as a mountain with two peaks, the south-western being 2,769 feet ($844^{m}0$) high and the higher of the two. Boom rots, above water, lies about half a mile off the southern side. Huismans eiland is situated close off the north-eastern side; two sunken rocks lie within a distance of half a mile south-south-eastward from it; and a ridge, with a depth of about 10 fathoms ($18^{m}3$) over it, extends about 2¼ miles eastward and 1½ miles south-eastward from it.

Sebuku, about one mile northward of Sebesi, is 1,188 feet ($362^{m}1$) high. A reef extends about 1½ miles from its western side, with a large rock above water near the outer edge; reefs also extend from some of the points of the island but they are not generally broad and are usually marked by rocks above water, on which is frequently a heavy surf. Sebuku kechil, known by the Dutch as Beschutters eiland, 460 feet ($140^{m}2$) high, lies about half a mile off the east coast; a reef, which dries, extends from the southern side of the islet, and northward of the islet is a steep-to coral reef, partly above water.

A light is exhibited, at an elevation of 114 feet ($34^{m}7$), from a white iron framework structure, 33 feet ($10^{m}1$) in height, on Ujong Chuku Banding, the northern extremity of Sebuku.

There is good anchorage for small vessels, in depths of from 15 to 18 fathoms ($27^{m}4$ to $32^{m}9$), clay, between Sebuku kechil and Sebuku. With bad weather from westward large vessels can anchor, in depths of from 13 to 15 fathoms ($23^{m}8$ to $27^{m}4$), clay, eastward of Sebuku kechil.

The channel between Sebesi and Sebuku is free from danger. The channel between the shoals extending westward from Sebuku and the Legundi eilanden may be safely used, and also the channel between Sebuku and the Sumatra coast.

Tiga eilanden.—Tiga eilanden, 2 miles northward of Sebuku, are rocky; the north-western islet is the largest, and from its north-western side a reef extends nearly 2½ cables, and is usually marked by breakers. There are depths of about 18 fathoms ($32^{m}9$) between the two south-eastern islets.

DIRECTIONS FOR SUNDA STRAIT.—Vessels making for Sunda strait from the Indian ocean, and steering for the south-western extremity of Java, will first sight Payung (page 54), which may sometimes be seen from a distance of 40 miles; closer in the lower land comes in sight, as well as Panaitan (Princes island) with the cone-shaped Raksa. *See* the caution on page 55 on making the land in hazy weather, and view on chart 2056.

If making a landfall near Vlakke hoek (*Lat. 5° 55′ S., Long. 104° 33′ E.*) on the Sumatra coast, Tanggamus and the summit of Tabuan eiland will be sighted first.

Vessels from southward may take Behouden passage or may pass westward of Panaitan, thence proceeding through the strait southward of Krakatau, and on either side of Sangiang, known by the Dutch as Dwars in den weg.

If the land has been made in the vicinity of Vlakke hoek, the Sumatra side may be held, passing between Sebesi and Sebuku; or vessels

Charts 1653a, 941a, 1263.

Chart 2056.

may pass southward of Krakatau, keeping more towards the Java shore. At night, except with local knowledge and a bright moon, the latter route is advisable, as vessels will then sight the light on Tanjong Chikoneng soon after passing Krakatau ; the light on Toppershoedje will assist vessels in navigating the north-eastern part of the strait. The passage eastward of Sangiang is clear of dangers, whereas Stroom klip lies in the passage westward of that island, and further north-eastward is Winsor klip.

Vessels coming from places on the western coast of Sumatra and taking the northern passage through Sunda strait must exercise the utmost caution when passing between Stroom klip (*Lat. 5° 55′ S., Long. 105° 49′ E.*) and the Pulau Sumur. The tidal streams here are very strong with many eddies, attaining a rate of 6 knots at times near Stroom klip, and this passage should never be used at night.

Charts 1653a, 941a, 1263.

CHAPTER IV

FROM SUNDA STRAIT NORTHWARD TO STRAAT BANKA

Charts 2056, 2149.

JAVA SEA.—Considerable swell comes from the China sea, particularly during the strength of the North-west monsoon, and a turbulent sea is frequently experienced, partly attributable to varying currents running in opposition to the wind.

Currents and tidal streams.—Except under the Sumatra coast, the horizontal movement of the water in the Java sea is mainly caused by the wind, and is, therefore, monsoon current ; the maximum rate of which is about 2 knots. *See* also page 12.

Under the Sumatra coast there is a weak diurnal tidal stream which runs northward with the rising tide and southward with the falling tide ; the change from south-going to north-going occurs practically at the time of low water, and the stream turns anticlockwise. The monsoon currents modify the directions of these streams as follows:—During the south-east monsoon the combined water flow is towards south-south-west or south-west on the falling tide and towards north-north-west or north-west on the rising tide ; during the west monsoon towards the south-south-east or south-east on the falling tide and towards north or north-north-west on the rising tide. In both monsoons the south-going tidal stream is strengthened by the monsoon, and the north-going stream is weakened.

In the open sea near the Duizend eilanden (Thousand islands) the water movement is almost entirely caused by the monsoons, and the rate never exceeds 2 knots. The west-going current starts in May and attains its maximum rate in June ; the east-going current starts in November and is strongest in February. The transition periods take place between March and May, and between October and December. During some period of any month in the year there may be no noticeable current.

Amongst the Duizend eilanden the currents caused by the monsoons start somewhat earlier and attain their maximum rate a month earlier. The west-going current gains the upper hand in March, and is strongest in April and May ; the east-going current starts in November, and is strongest in December. The east-going current is always the stronger ; in December it is double the strength of the west-going current in April and May.

In the vicinity of Straat Banka, as far southward as Tanjong Mendjangan (*Lat. 3° 50′ S., Long. 105° 58′ E.*), during the strength of the

Charts 1653a, 941a, 1263.

Charts 2056, 2149.

west monsoon, the north-going tidal stream may be overcome by the south-going monsoon current, so that the resultant flow of water is sometimes to the south for days together, with rates up to a maximum of 2¼ knots. On other days the water only sets northward for 4 hours at the most during a complete day, with a maximum rate of half a knot.

Chart 2056.

ISLETS AND DANGERS IN THE NORTHERN APPROACH TO SUNDA STRAIT.—Duizend eilanden.—The main group of the Duizend eilanden (Thousand islands) extends in a north and south direction off the north coast of Java between the meridians 106° 30′ E. and 106° 37′ E., and is described in Eastern Archipelago Pilot, Vol. II.; north-westward of the main group and near the usual route taken by vessels making for Sunda strait from the northward, is a smaller group consisting of four islets and several reefs, which is separated from the northern end of the main group by a channel with depths of from 14 to 17 fathoms ($25^{\mathrm{m}}6$ to $31^{\mathrm{m}}1$).

Dua eilanden, two in number, are the easternmost of the north-western group of the Duizend eilanden; they are thickly wooded with high trees and lie about 38 miles north-eastward of Tanjong Pudjut (St. Nicolas point), the north-western extremity of Java. There is a deep channel between these two islets.

Gosong Rangat, an islet, 3½ miles south-westward of the eastern of the Dua eilanden, is also wooded with high trees. Beronang rif, with a depth of 1¼ fathoms ($2^{\mathrm{m}}3$) over it, is situated nearly 2 miles northward of Gosong Rangat and is not marked in any way at high water. Edeling reefs, with depths of 3¾ and 4¼ fathoms ($6^{\mathrm{m}}9$ and $7^{\mathrm{m}}8$) over them, lie, respectively, about 1¾ miles north-eastward and 1½ miles north-north-eastward of Gosong Rangat (*Lat. 5° 28′ S., Long. 106° 26′ E.*). Rangat rif, about one mile south-eastward of Gosong Rangat, has a least depth of 3 feet ($0^{\mathrm{m}}9$) over it; it is usually marked by discoloration and breaks with any sea.

Pebelokan, known to the Dutch as West eiland, about 2¾ miles west-south-westward of Gosong Rangat, is thickly wooded with high trees.

Coventry reef, about one mile south-south-westward of Pebelokan, dries in patches at its northern end; it is marked by discoloration and breaks with the least sea or swell.

Hereward reef, about 3½ miles west-north-westward of the western of the Dua eilanden, has a depth of 1¼ fathoms ($2^{\mathrm{m}}3$) over it, and is not marked by discoloration.

Arminia klip, about 3¼ miles westward of Hereward reef, is a small steep-to patch, with a depth of 2½ fathoms ($4^{\mathrm{m}}6$) over it, and is not marked by discoloration.

Jason rots, the westernmost danger of this group, about 5 miles westward of Arminia klip, is a small coral patch, with a least depth of 2 fathoms ($3^{\mathrm{m}}7$) over it, and only under very favourable conditions is there discoloration in the immediate vicinity, and very occasionally there are tide-rips. *See* page 88 for directions for avoiding this danger.

Etna droogte.—Light.—Etna droogte, a steep-to coral reef with a patch, which dries in the middle, is situated about 26 miles east-north-eastward of the Dua eilanden.

Charts 1653a, 941a, 1263.

Chart 2056.

A light is exhibited, at an elevation of 48 feet ($14^{m}6$), from a white iron structure, 33 feet ($10^{m}1$) in height, situated on the western side of Etna droogte (*Lat. 5° 18′ S., Long. 106° 54′ E.*).

Arnemuiden droogte.—Light.—Arnemuiden droogte lies about 11 miles west-north-westward of Etna droogte and is a coral patch with a small bank of white coral sand, which dries, on it.

A light is exhibited, at an elevation of 31 feet ($9^{m}4$), from a black iron light-beacon with spherical topmark, 26 feet ($7^{m}9$) in height, situated on Arnemuiden droogte.

Noordwachter.—Light.—Noordwachter (North Watcher), situated nearly 17 miles westward of Arnemuiden droogte, is entirely covered with high trees and is generally visible 14 miles. The island is surrounded by a reef which partly dries. There is a small haven on the north-western side, formed by a coral breakwater, affording good anchorage for boats; there is also a stone breakwater, with a flagstaff on its head, westward of the lighthouse.

Omega, a reef, with a depth of 2 feet ($0^{m}6$) over it, lies about half a mile south-eastward of Noordwachter, and Karang Pajong, with a depth of 5 feet ($1^{m}5$) over it, is situated about the same distance southward of the island; between these two reefs and the island there are depths of 14 fathoms ($25^{m}6$), mud and sand.

A light is exhibited, at an elevation of 159 feet ($48^{m}5$), from a white iron framework tower, 157 feet ($47^{m}9$) in height, situated on Noordwachter.

Brouwers banken.—Brouwers banken are two coral patches, about 2 cables apart in a north and south direction, lying about 13 miles north-westward of Noordwachter; at high water only a few rocks on them are visible, and there is a small patch of coral sand on the northern.

Samang (page 85), in line with the northern islet of Pulau Segama, known to the Dutch as Gebroeders (*Lat. 5° 10′ S., Long. 106° 07′ E.*), bearing about 241°, leads close north-westward of Brouwers banken; the same hill bearing about 245°, and open south-eastward of the southern islet, leads close south-eastward.

Chart 2149.

About 6 miles north-westward of Brouwers banken a bank was passed over by H.M.S. *Magpie* in 1883; a least depth of 6½ fathoms ($11^{m}9$) was obtained with Pulau Segama bearing 203°, distant 8 miles.

A shoal, with a depth of 26 feet ($7^{m}9$) over it, was reported to exist, in 1949, about 4 miles north-westward of Brouwers banken; its charted position is approximate.

Chart 2056.

Lynn rif.—Lynn rif, about 15 miles westward of Noordwachter, is of coral and has a least depth of 2 feet ($0^{m}6$) over it, with depths of from 6 to 13 fathoms ($11^{m}0$ to $23^{m}8$), mud and sand, about one cable outside it. The reef is barely marked by ripples and discoloration and can only be detected close to; it sometimes breaks with a heavy easterly swell.

Pulau Segama.—Pulau Segama (Two Brothers), known by the Dutch as Gebroeders, about 21 miles westward of Noordwachter, are two coral islets thickly wooded with high trees; they are surrounded by a coral reef, which dries, with some rocks and patches of sand above water on it. A coral patch, with a depth of 2 feet ($0^{m}6$) over it, lies

Charts 2149, 1653a, 941a, 1263.

Chart 2056.

about 3 cables southward of the southern islet. In the west monsoon Pulau Segama can sometimes be seen from a distance of 20 miles, but in the south-east monsoon they are not visible until very much nearer.

Directions for passing westward of Pulau Segama are given on page 85.

Swallow rif.—Swallow rif, with a depth of 26 feet ($7^{m}9$) over it and steep-to, is a coral patch lying 7¾ miles south-south-westward of Pulau Segama.

A 4¾-fathom ($8^{m}7$) patch lies about 5½ miles west-north-westward of Swallow rif (*Lat. 5° 18′ S., Long. 106° 04′ E.*).

Charts 2056, 2149.

EASTERN COAST OF SUMATRA.—General remarks.—The eastern coast of Sumatra, between Tanjong Sumur Batu (Steile hoek), *see* page 74, and Lucipara punt, about 160 miles northward, is, except for Samang and a few other hills in the southern part, low, flat, swampy near the coast, and practically uninhabited; in the west monsoon the hills in the southern part may be seen from a distance of about 24 miles, and in the south-east monsoon from 12 to 16 miles. A bank of soft mud, from one to 5 cables broad, which dries, fringes almost the whole of this coast except by the mouths of the large rivers, or at a few places where there are sandy beaches. Outside this bank the depths increase gradually, though frequently irregularly, seaward, and there is good anchoring ground everywhere; except near the shoals and reefs, the bottom is generally clay, covered with a layer of mud near the coast.

Caution.—Small, steep-to shoals, of the approach to which sounding gives little or no warning, lie in various places within a distance of about 16 miles from the coast, and, off Tanjong Mendjangan, fully 30 miles offshore; hard bottom, consisting of white or black sand with or without shells, is generally an indication that a vessel is near one of these shoals. The coast in the vicinity of Wai Tulang Bawang (page 86) should not be approached within a depth of less than 9 fathoms ($16^{m}5$), and elsewhere within a depth of less than 7 fathoms ($12^{m}8$).

Winds.—Between April and October strong south-south-westerly winds occur at times southward of Pulau Segama (Two Brothers), generally setting in during the evening and blowing all night.

Chart 2056.

Coast.—Ujong Kanggalan (*Lat. 5° 48′ S., Long. 105° 48′ E.*) is a low point about 3 miles north-north-eastward of Tanjong Sumur Batu (page 74), the intervening coast being low and wooded. A reef, with a depth of 2½ fathoms ($4^{m}6$) over it, lies about 2 cables eastward of Ujong Kanggalan. From abreast this point the western of the two peaks of Radja Basa (page 63) is noticeable. Taman, a hill 774 feet ($235^{m}9$) high, 2½ miles westward of Ujong Kanggalan, is a good landmark, and about 2 miles north-eastward of the hill, and near the coast, is a very prominent, isolated, conical hill, 226 feet ($68^{m}9$) high.

Ketapang village is situated near the coast 3 miles northward of Ujong Kanggalan. Close northward of the village some steep, rocky cliffs, named Batu Putih, border the coast for about 2 cables; as these cliffs are very light in colour they can be seen for some distance, when the sun shines on them. Northward of Batu Putih cliffs the coast is low, marshy, thickly wooded, and fronted by a sandy beach.

Charts 2149, 1653a, 941a, 1263.

Chart 2056.

Islets and reefs.—Kupiah, high and covered with vegetation, is situated about 8 cables northward of Ujong Kanggalan and half a mile offshore.

De Gezusters are three low islets lying near the coast about 2½ miles northward of Ujong Kanggalan. The western half of Seram, the northernmost and largest, is covered with high coconut trees, and the eastern side is a swamp, with a few bare tree trunks on it. A coral patch, with a depth of 5½ fathoms ($10^{m}1$) over it, lies about three-quarters of a mile eastward of this islet. The middle and smallest islet is almost entirely formed of coral, and is covered with bushes and a few bare trees. The southern islet is covered with low brushwood, with a few coconut trees, and there is a sandy beach on its north-western side. Seram is the only islet that can be seen from any distance. They all lie within the 3-fathom ($5^{m}5$) line; small craft with local knowledge can find shelter between them and the coast, where there are depths of a few feet, sand and mud.

Mundu, about 3¾ miles north-north-eastward of Seram, is a low coral island covered with coconut trees, and fringed by a reef with some rocks above water on it; Sina eilandje lies close southward of the island. Sibrandi rif, half a mile eastward of Sina, has a least depth of 3¼ fathoms ($5^{m}9$) over it, and is very steep-to on its eastern side; the passage between the reef and Mundu is unsafe.

Directions.—Vessels proceeding northward from de Gezusters, and passing between Mundu and the coast, will keep in depths of over 5 fathoms ($9^{m}1$) by keeping the summit of Rimau Balak (page 75) bearing about 197°, and open just eastward of the eastern side of Seram.

Wai Sekampung.—**Anchorage.**—Tanjong Sekampung lies 6 miles northward of Mundu (*Lat. 5° 41′ S., Long. 105° 50′ E.*), but is difficult to distinguish unless close inshore southward of it; Wai Sekampung, one of the largest rivers in the Lampung district of Sumatra, flows out on the northern side of the point. There is no special channel over the bar, on which there is generally surf in the south-east monsoon, but by keeping the mouth of the river open, on a bearing of about 247°, a least depth of 2 feet ($0^{m}6$) can be carried over it. Within the mouth the depths increase rapidly to 4 and 5 fathoms ($7^{m}3$ and $9^{m}1$). Kampong Assahan is situated about 32 miles up the river.

There is anchorage off Wai Sekampung, in a depth of 9 fathoms ($16^{m}5$), mud, 1¼ miles offshore, with a prominent tree on Mundu bearing 188°, and the mouth of the river open, bearing 247°. The rate of the stream is from 1½ to 2 knots.

Coast.—**Dangers.**—**Buoy.**—The coast between Tanjong Sekampung and Tanjong Penet, 19 miles northward, is thickly wooded with high trees, sometimes visible up to a distance of 14 miles. Several rivers flow out, the principal being the Nibung and Maringgai, about 9 and 13 miles, respectively, northward of Tanjong Sekampung, which are accessible for boats at high water; the latter river can be ascended as far as Kampong Maringgai, about 2 miles up. Tanjong Penet is a round point, and can only be distinguished when within 4 miles of the coast; a reef, with a depth of less than 6 feet ($1^{m}8$) over it, lies about 3¾ miles southward of this point and close outside the 3-fathom ($5^{m}5$) line. Wai Penet, which flows out close northward of Tanjong Penet, is of no importance.

Charts 2149, 1653a, 941a, 1263.

Chart 2056.

Pematang Urai, about 10 miles north-north-westward of Tanjong Sekampung, is 610 feet (185^{m}9) high and the southernmost of a very prominent group of hills decreasing in height northward. Samang, a hill 5 miles north-north-eastward of Pematang Urai, is 742 feet (226^{m}2) high. Labuan Ratu (Knobbelberg), about 12½ miles westward of Tanjong Penet, is 810 feet (246^{m}9) high, and is very prominent on account of a knob on its summit, having the same appearance from all directions. *See* view facing page 77.

Charts 2056, 2149.

Between Tanjong Penet (*Lat. 5° 16′ S., Long. 105° 52′ E.*) and Tanjong Sekopong, about 20 miles northward, the land is flat, thickly wooded and indistinguishable from any distance. Tanjong Sekopong is a round, prominent point, thickly wooded with high trees; a peninsula, covered with casuarina trees, extends from the point, and is connected to it by a narrow strip with only a few trees on it. Tanjong Sekopong cannot be distinguished beyond the 5-fathom (9^{m}1) line.

Swallow rif, the 4¾-fathom (8^{m}7) patch about 5½ miles west-north-westward of it, and Pulau Segama have been described on pages 82-83.

Sjahbandar (Shahbandar) bank consists of a number of sandy ridges lying within 8 miles of the coast nearly midway between Tanjong Penet and Tanjong Sekopong; they all lie within the 5-fathom (9^{m}1) line. Vessels passing between these banks and Pulau Segama (page 82) will find Samang and the other hills south-westward of Tanjong Penet useful landmarks for fixing their positions; the side of the channel nearest Pulau Segama should be held. At night, or with bad visibility, they should keep in depths of not less than 6 fathoms (11^{m}0).

Chart 2149.

The 6½-fathom (11^{m}9) bank about 6 miles north-westward of Brouwers banken (*Lat. 5° 05′ S., Long. 106° 16′ E.*) has been described on page 82.

Clifton bank, nearly 10 miles eastward of Tanjong Sekopong, is a patch of hard sand with a least depth of 16 feet (4^{m}9) over it. In the west monsoon Pulau Segama are generally visible from the vicinity of this danger, but it is unlikely that they will be seen in the south-east monsoon until the vessel is further southward. A conical buoy, painted in black and white chequers, surmounted by a ball, is moored off the eastern side of Clifton bank. *See* view facing page 77.

A patch, with a least depth of 8 feet (2^{m}4) over it, lies south-westward of Clifton bank and about 5 miles south-eastward of Tanjong Sekopong.

Coast.—Dangers.—Beacon.—The coast between Tanjong Sekopong and Tanjong Kenam, about 16 miles northward, is marshy. Sungei Wakau, a small river, flows out about 6 miles northward of Tanjong Sekopong. Tanjong Kenam can be readily distinguished from Tanjong Sekopong from southward, as it is covered with trees of regular and equal height. Wai Seputi flows out on the southern side of Tanjong Kenam, but is only accessible for praus, as there is a depth of not more than 3 feet (0^{m}9) on the bar; two tributaries, Wai Pegadungan and Wai Terusan, flow into Wai Seputi a few miles above its mouth. Surabaya Ilir, the first village of importance, is situated on the right bank of the main river and about 10 miles inland. A shoal, with a least depth of 3 fathoms (5^{m}5) over it, lies about 7½ miles south-eastward of Tanjong Kenam. Vessels with local knowledge

Chart 2149.

can obtain anchorage off Wai Seputi, in a depth of 19 feet ($5^{m}8$), soft mud, with Tanjong Kenam bearing 331°, and the mouth of the river, bearing 304°, distant 4 miles.

Tanjong Bungin is situated about 7 miles northward of Tanjong Kenam, and the trees along the coast between this point and Tanjong Serdang, about 5 miles northward, are considerably higher than those northward or southward, so that at a distance this part of the coast appears as an island. A mudbank, which dries, extends about one mile from the coast between Tanjong Serdang (*Lat. 4° 27′ S., Long. 105° 54′ E.*) and Tanjong Tmak, about 3 miles north-westward.

Floating islets, drifting from the rivers and covered with vegetation, become stranded on the drying mudbanks off Tanjong Serdang.

The coast between Tanjong Kenam and Tanjong Tmak is fronted by banks of mud and sand, having depths of only a few feet over them in places, which extend about 13 miles offshore. A black beacon, surmounted by a cone, stands on the northern end of these banks and about 9 miles north-eastward of Tanjong Serdang. The outer edges of these banks are steep-to, and the banks are only occasionally marked by surf during the south-east monsoon.

Wai Tulang Bawang.—Beacons.—Anchorage.—Directions.— Wai Tulang Bawang, one of the largest rivers in the southern part of Sumatra, traverses the land in a general east and west direction, and enters the sea between Tanjong Tmak and Tanjong Bubuayun. In 1949 the depth on the bar off the mouth was 4 feet ($1^{m}2$), and the rise of tide is usually less than 5 feet ($1^{m}5$). Just within the entrance the river is about 2 cables wide, with depths of 6 fathoms ($11^{m}0$), and thence the width decreases gradually up stream to barely half a cable at Menggala, situated about 60 miles above the mouth, and the depths to 2 fathoms ($3^{m}7$). Teladas, a village, lies about 5 miles above the entrance.

The approach to the river is marked by two black beacons surmounted by cones, and one white beacon surmounted by a ball. The mouth of the river is marked by beacons surmounted by balls on the northern side, and beacons surmounted by crosses on the southern side, all maintained privately.

There is anchorage off the mouth of Wai Tulang Bawang, northward of the banks which extend from the coast between Tanjong Kenam and Tanjong Tmak; this roadstead is known as Rede van Dintiteladas. The anchorage should be approached on the parallel of lat. 4° 15′ S., and vessels from southward should keep in depths of not less than 9 fathoms ($16^{m}5$) until on this parallel. When Tanjong Serdang bears 225° a vessel should take care to be in a depth of not less than 7 fathoms ($12^{m}8$), and in this position other portions of the land will become visible, the high trees between the mouths of Wai Tulang Bawang and Ayer Mesudji, about 13 miles northward, being the first to be sighted. The southern end of these trees forms a good mark for bearings and the high trees on Tanjong Pasir, the northern entrance point of Ayer Mesudji, are also a good landmark. When Tanjong Bubuayun (*Lat. 4° 23′ S., Long. 105° 52′ E.*) bears 202°, and the depths decrease to about 5 fathoms ($9^{m}1$), course should be altered to 180°, anchoring when this point bears 225°, in depths of from 3¼ to 3¾ fathoms ($5^{m}9$ to $6^{m}9$). Local knowledge is essential for vessels proceeding up the river, and attention must be paid to the broken trunks of trees

Charts 941a, 1263.

Chart 2149.

standing in the water; there are four difficult bends to negotiate between the entrance and Menggala.

Menggala is the headquarters of a Government official. Vessels moor alongside a wharf there, but it is advisable to make use of an anchor and warp.

Ayer Mesudji. — Anchorage. — Directions. — Although not so large as Wai Tulang Bawang, Ayer Mesudji is of some importance as praus can reach Palembang from it, passing through Sungei Padang, Sungei Babatan and Ayer Komering. The least depth on the bar off the mouth of Ayer Mesudji, in 1949, was 5 feet ($1^{m}5$), soft mud. Tanjong Tawar, the southern entrance point, is difficult to identify. Within the entrance the depths vary from 5 to 6½ fathoms ($9^{m}1$ to $11^{m}9$), and vessels with a length of about 150 feet ($45^{m}7$) and a draught of 8 feet ($2^{m}4$) can easily reach the village of Sungei Sodong, situated about 80 miles above the mouth, where the flood stream is still noticeable.

Anchorage can be obtained about 5 miles south-eastward of the mouth of Ayer Mesudji, which will then be seen entirely open, in a depth of about 3¾ fathoms ($6^{m}9$). To reach this anchorage, vessels should steer for the mouth of the river, bearing about 293°, until in a depth of 5 fathoms ($9^{m}1$), when a westerly course may be steered for the above position. This route leads well clear northward of the banks off the mouth of Wai Tulang Bawang. Local knowledge is essential for vessels proceeding up the river.

Coast.—The coast between Tanjong Pasir and Tanjong Mendjangan, about 20 miles northward, is low. The northern side of the latter point is covered with high, dark trees, which decrease on either side to a light-green growth, giving the point the appearance of an island when seen from a distance from south-eastward or north-north-eastward.

Telok Berugu is a shallow bay immediately northward of Tanjong Mendjangan; its shore is alternately sandy beach and swamp, and landing can be effected on the sandy parts. Kuala Sondan, a creek in the southern part, dries.

Several small rivers discharge between Tanjong Mendjangan and Lucipara punt (*Lat. 3° 14′ S., Long. 106° 05′ E.*), about 37 miles northward, and their mouths can generally be identified from a considerable distance, owing to the higher growth of trees there. Sungei Lumpur flows out about 25 miles northward of Tanjong Mendjangan, and is of some importance owing to the fact that small vessels can proceed to Palembang through it and its tributaries. The entrance is marked by nipa palms growing on the broad mudbanks on either side; the channel here had a depth of 6 feet ($1^{m}8$) in 1949, increasing rapidly to from 2¾ to 5 fathoms ($5^{m}0$ to $9^{m}1$) inside the mouth, where the river is nearly 1½ cables broad. There are only slight bends in the lower reach, but a few miles up these become short and sharp. Anchorage can be obtained, in a depth of 3¼ fathoms ($5^{m}9$), with the mouth of the river bearing 305°, distant 8 miles, but caution must be exercised when approaching, as a ridge of sand, with a depth of 2¾ fathoms ($5^{m}0$) over it, lies on this bearing and about 14 miles from the mouth.

Sungei Lebong Hitam flows out about 5 miles north-north-eastward of the mouth of Sungei Lumpur, and is barely half a cable broad at the mouth, with a least depth of 4 feet ($1^{m}2$) on the bar, increasing

Charts 941a, 1263.

Chart 2149.

to 1¾ fathoms (3^{m}2) inside; the best course to enter the river is 305°, with the mouth open. Although the coast here is uninhabited, there are usually numerous praus from Banka and Palembang making a temporary stay. Sungei Riding flows out nearly 2 miles north-eastward of Sungei Lebong Hitam, and is about half a cable broad, with a least depth of 5 feet (1^{m}5) on the bar, increasing rapidly to 1¾ and 2½ fathoms (3^{m}2 and 4^{m}6) inside; the best course for entering is with some high trees on the northern bank bearing 326°.

Off-lying dangers.—Four Fathom banks consist of a number of patches of mud and sand, with a least depth of 26 feet (7^{m}9) over them, lying about 23 miles eastward of the mouth of Ayer Mesudji; vessels of deep draught must pass eastward of them.

Depths of less than 6 fathoms (11^{m}0) extend offshore eastward of Tanjong Pasir to within 3 miles of Four Fathom banks, and a depth of 23 feet (7^{m}0) exists about 5½ miles west-north-westward of the shoalest part of those banks.

Arend droogte, about 15 miles eastward of Tanjong Mendjangan, is the south-eastern extremity of the bank which extends from the coast northward of this point; it has a least depth of 3 fathoms (5^{m}5) over it, hard bottom. The tops of the highest trees on Tanjong Mendjangan are generally just visible from the bank, but, as the recommended route for vessels lies eastward of it, these trees should not be sighted.

Five Fathom banks consist of patches of mud and sand, with a least depth of 23 feet (7^{m}0), lying from 28 to 35 miles eastward of Tanjong Mendjangan; vessels of deep draught should pass eastward of these banks.

A patch, with a least depth of 6 fathoms (11^{m}0) over it, lies about 23 miles south-eastward of Lucipara punt and there is a 7-fathom (12^{m}8) patch about 40 miles east-south-eastward of the same point.

Charts 2056, 2149.

DIRECTIONS.—**Sunda strait to Straat Banka.**—*By day.*—Vessels coming out of Sunda strait usually steer a north-north-easterly course so as to pass between Jason rots (*Lat. 5° 25′ S., Long. 106° 17′ E.*) and Swallow rif, and thence between Noordwachter and Brouwers banken or close along Pulau Segama, which can be passed on either side; in either case, care must be taken to avoid Lynn rif, and, if passing westward of Pulau Segama, Sjahbandar bank must be given a wide berth, thence passing eastward of the buoy marking Clifton bank. Directions for passing westward of Pulau Segama are given on page 85. The route then lies eastward of Four Fathom banks and Five Fathom banks; the passage between the latter and Arend droogte is not advisable. When northward of Brouwers banken the Sumatra coast, including the high trees on Tanjong Serdang and Tanjong Mendjangan, should never be sighted, even in the clear weather of the west monsoon; if this land is sighted in the hazy atmosphere of the south-east monsoon it is definitely a warning that a vessel is too far westward of her safe course.

At night.—Vessels coming out of Sunda strait, from a position between Toppershoedje and Tanjong Pudjut, should steer northward for about 25 miles, and then north-eastward, so as to pass between Swallow rif and Jason rots and sight Noordwachter light on a bearing of about

Charts 941a, 1263.

Charts 2056, 2149.

057° ; it must be borne in mind, however, that this light will not be visible, even on a clear night, until within about 2 miles of Jason rots. Thence pass from 2 to 4 miles westward of Noordwachter light and eastward of Four Fathom and Five Fathom banks, giving the latter a wide berth.

From Straat Banka to Sunda strait.—Vessels proceeding southward from Straat Banka should follow the directions just given for those proceeding northward from Sunda strait, in the reverse order. From near Pulau Segama the hilly land on Sumatra southward of Tanjong Penet will come in sight, but these hills will not be visible to vessels proceeding by the route near Noordwachter (*Lat. 5° 12′ S., Long. 106° 28′ E.*) ; Gedé, and some of the other mountains near the north-western extremity of Java, are also sometimes visible from near Pulau Segama.

Charts 1653a, 941a, 1263.

CHAPTER V

STRAAT BANKA.—NORTH-WESTERN AND NORTHERN COASTS OF BANKA

Chart 3471.

STRAAT BANKA.—General description.—Straat Banka, about 120 miles in length, separates Sumatra and Banka, and has a general north-westerly and south-easterly direction. It is the best route between Sunda strait and Singapore. *See* views facing pages 104, 105.

The Sumatra coast, forming the western side of the strait, is low, densely wooded, and affords no conspicuous marks; the entire coast is bordered by a mud flat, narrow by the points, but extending from one mile to 7½ miles offshore, with depths of less than 3 fathoms ($5^{m}5$) in the bights. Towards the Banka side the bottom becomes harder, and even rocky. Banka, forming the eastern side of the strait, in contrast to the Sumatra side, has numerous hills and mountains, and it is remarkable that, although the latter attain no great elevation, their summits are generally obscured by clouds. Muntok (*Lat. 2° 05′ S., Long. 105° 10′ E.*), at the northern entrance to Straat Banka, is the principal port.

Several rivers discharge into the strait, of which the Ayer Musi and Banju Asin, in Sumatra, are navigable for a considerable distance. There are numerous unimportant streams along the Banka shore, and the land is usually marshy for some distance by their mouths.

Besides a few small islets and rocks in the strait, there are the Nangka eilanden, situated off about the middle of the Banka shore; nearly all of them are of coral formation.

Numerous sandbanks lie in the southern entrance, with two main channels between them, namely, Lucipara and Stanton passages; Stanton passage is buoyed and lighted, but Lucipara passage is unmarked. Stanton passage is available for vessels of deep draught, as a least depth of 6 fathoms ($11^{m}0$) can be carried through it.

Caution.—Vessels proceeding through Straat Banka should determine their position mainly by the landmarks on the Banka side. The muddy Sumatra shore is constantly undergoing change, especially in places where mangroves stand in the water; some of the points are receding, whilst others are working out. The few points can only be identified at short distances, and are easily mistaken for the so-called False points, which are observed immediately after rounding the real points. Mariners must, therefore, guard against placing any reliance on bearings taken of the Sumatra shore.

Currents and tidal streams.—Under the Sumatra shore there is a current setting south-eastward throughout the entire year; from

Charts 2149, 941a, 1263.

December to March the rate of the current is higher than from May to November. In Lucipara passage vessels are consequently always set out of the strait; in the north-west monsoon the rate of the current setting south-eastward here is doubled, whilst in the south-east monsoon the rate is low.

The tidal streams flow into Straat Banka from both ends, meeting in the neighbourhood of Nangka eilanden. There is usually only one strong in-going stream a day and two weaker out-going streams separated by a slack period. Daily predictions of the streams at the two ends of the strait are made, *see* below.

Tide-rips are frequently found abreast the Nangka eilanden during the south-east monsoon, and are probably due to the meeting of the current setting south-eastward along the Sumatra shore in the northern part of the strait with the current setting north-westward along the Banka shore in the southern part of the strait.

Vessels must guard against being set in or out off the mouth of Ayer Musi (Palembang rivier).

The tidal streams off Nemesis bank (*Lat. 2° 53′ S., Long. 106° 00′ E.*) are predicted in Admiralty Tide and Tidal Stream Tables. They set in south-easterly and north-westerly directions. The predictions give times of maximum rate in either direction, times of turn and maximum rate in either direction.

The horizontal water movement at Nemesis bank is the resultant of the tidal stream and the predominating southerly current referred to above which sets south-eastward at a rate of one knot in January, ¾ knot in February and December, ½ knot in March and November, and ¼ knot in April and October; in July the monsoon current sets north-westward at a rate of ¼ knot.

The maximum rate of the flow south-eastward (including the current) can be expected to average 2½ knots in December, January, and February, with diurnal spring tides; the maximum rate of the flow north-westward (including the monsoon current) can be expected to average 2 knots in June and July, with diurnal spring tides.

The tidal streams off Amelia bank (*Lat. 2° 13′ S., Long. 105° 15′ E.*) are predicted in Admiralty Tide and Tidal Stream Tables. They set in east-south-easterly and west-north-westerly directions. The predictions give the times of maximum rate in either direction, times of turn and maximum rate in either direction.

The horizontal water movement at Amelia bank is the resultant of the tidal stream and the predominating southerly current previously referred to, which sets east-south-eastward at a rate of one knot in January, ¾ knot in February and December, ½ knot in March and November, and ¼ knot in April and October; in July the monsoon current sets west-north-westward at a rate of ¼ knot.

The maximum rate of the flow east-south-eastward (including the current) can be expected to average 2 knots from November to December and from January to March, inclusive, with diurnal spring tides; the maximum rate of the flow west-north-westward (including the monsoon current) can be expected to average 1¼ knots in June and July, with diurnal spring tides.

SOUTHERN ENTRANCE TO STRAAT BANKA.—The southern entrance to Straat Banka, between Lucipara punt (*Lat. 3° 14′ S.,*

Chart 3471.

Long. 106° 05′ E.) and Dapur eilanden, about 26½ miles eastward, is divided into two channels by Lucipara, an islet 151 feet ($46^{m}0$) high, situated about 8 miles eastward of Lucipara punt, and the banks lying northward of this islet. Lucipara passage is the western of these channels, and Stanton passage is the eastern; both passages unite between Tanjong Kojan (Valsche Eerste punt) and Tanjong Panggung (Lelari), about 30 miles within the entrance.

Lucipara passage.—Lucipara passage has a least depth of 26 feet ($7^{m}9$) in the fairway, so is only available for vessels of moderate draught and is not recommended. The western side of the channel is bounded by a mudbank, with depths of less than 3 fathoms ($5^{m}5$), which extends from one to 2 miles from the Sumatra shore; on the eastern side of the channel are Lucipara, Hindostan bank, and Merapi droogte.

Lucipara punt is working out (*see* caution on page 90), but sounding here gives due warning when a vessel is near the mudbank which extends from the coast near this point; from a position about 8 miles northward as far as Tanjong Kojan this mudbank is steep-to. Between Lucipara punt and Tanjong Kojan, about 18 miles north-north-westward, the entire coast is covered with mangroves, with higher trees on the projecting points. Tanjong Djati Gombol (Grune hoek), the trees on it being of a lighter and brighter green than elsewhere, is situated about 9 miles northward of Lucipara punt; between these two points is a ridge of high trees, standing about 1½ miles within the mangroves. Tanjong Djati (Eerste punt), about 13½ miles northward of Lucipara punt, has level trees on it. The trees on Tanjong Kojan are about 100 feet ($30^{m}5$) high, and this point should not be approached in a depth of less than 12 fathoms ($21^{m}9$).

Lucipara is a thickly wooded islet, and in fine weather can generally be identified from a distance of about 15 miles; it is surrounded by a reef, which dries about 4 feet ($1^{m}2$). Shoal ground, with depths of less than 3 fathoms ($5^{m}5$) over it, extends about 2¾ miles south-eastward and about 1½ miles north-north-westward from the islet. A patch, with a least depth of 23 feet ($7^{m}0$) over it, lies about 3¼ miles south-south-westward of Lucipara (*Lat. 3° 13′ S., Long. 106° 13′ E.*).

Hindostan bank, hook-shaped and of hard sand, with a least depth of 5 feet ($1^{m}5$) near its northern end, lies between 6¾ and 10¾ miles north-westward of Lucipara and from 3 to 5 miles offshore. There is a ridge, with a least depth of 13 feet ($4^{m}0$) over it, about 4¾ miles north-north-eastward of Lucipara; between this ridge and Hindostan bank two ridges, composed of hard sand and stone, lie approximately parallel to Hindostan bank and about 1½ and 3 miles eastward of it, with least depths of 2 feet ($0^{m}6$) and 3 feet ($0^{m}9$), in positions 6½ and 9¼ miles, respectively, north-north-westward of Lucipara. A detached shoal, with depths of 3 fathoms ($5^{m}5$), or less, over it and a least depth of 5 feet ($1^{m}5$) near its southern end, lies about one mile eastward of the northern extremity of Hindostan bank. A 3-fathom ($5^{m}5$) patch is situated about 2 miles eastward of the northern end of Hindostan bank. The passages between the above banks are unsafe for navigation.

Merapi droogte, also of hard sand, with a least depth of 3 fathoms ($5^{m}5$) over it, lies about 3½ miles east-south-eastward of Tanjong Djati (Eerste punt) and is extending westward. Smits, Melvill and Nemesis banks are described with Stanton passage on pages 94, 95.

Charts 2149, 941a, 1263.

Chart 3471.

Stanton passage.—Lights.—Buoyage and beacons.—Stanton passage, the eastern and main entrance to Straat Banka from the southward, is lighted and buoyed, and is easy to navigate; there is a least depth of 39 feet (11^m9) on the leading marks for this passage given in the Directions on page 104. There are, however, two patches, each with a least depth of 29 feet (8^m8) over it, in the approach; one of these lies about 7 miles southward of the light-structure on Dapur, and the other is about 8½ miles south-westward of this light-structure. Anchorage can be obtained anywhere in this passage, but vessels should always have a second anchor ready, as heavy squalls may suddenly arise, especially in the transition months between the north-west and south-east monsoons.

Dapur eilanden are two small islets lying on a steep-to bank, with depths of less than 3 fathoms (5^m5); the southern islet is situated about one mile southward of Tanjong Langgan, the southern extremity of Banka, and is 115 feet (35^m0) high. The channel between these islets and Tanjong Langgan is foul.

A light is exhibited, at an elevation of 132 feet (40^m2) from a white iron structure, 46 feet (14^m0) in height, situated on the southern of the Dapur eilanden.

Tanjong Langgan (*Lat. 3° 07′ S., Long. 106° 31′ E.*) is fringed by several high rocks, which from a distance of from 7 to 10 miles have the appearance of a large town on the coast. Lama, a prominent hill, 509 feet (155^m1) high, about 1¼ miles north-north-eastward of Tanjong Langgan, is in the form of a pyramid. Tanjong Nangka, about 2¼ miles north-westward of Tanjong Langgan, is easily identified, as it has a rounded hill on it, 264 feet (80^m5) high.

The coast between Tanjong Nangka and Tanjong Ketapang, a fairly high point about 5½ miles north-north-westward, is marshy and covered with mangroves, except for a sandy beach at Toboali, immediately eastward of Tanjong Ketapang; Rede Toboali is described on page 95. Gadung, 588 feet (179^m2) high, is a prominent conical hill situated about 3 miles north-eastward of Tanjong Ketapang. Toboali, about 1½ miles south-eastward of Gadung, has a double peak and is very steep on its western side. Sint Paul (Muntai), about one mile eastward of Toboali, also has a double peak, the higher of which is 988 feet (301^m1) high and slopes gradually on its south-eastern side. When seen from the westward the eastern peak of Sint Paul is not visible, and its western peak appears to form a saddle with Toboali.

A light is exhibited, at an elevation of 20 feet (6^m1), from a white iron structure, 20 feet (6^m1) in height, situated on the head of the mole at Toboali.

The coast between Tanjong Ketapang and Tanjong Gosong, about 4 miles north-westward, is marshy and uniformly covered with vegetation; a wooden pier, with a depth of 5 feet (1^m5) alongside its head, extends from a position on the coast about three-quarters of a mile northward of Tanjong Ketapang. About one mile northward of Tanjong Ketapang there are numerous prominent white above-water rocks on the bank which extends as much as three-quarters of a mile from the coast and dries. Sungei Gosong flows out close eastward of Tanjong Gosong. Between this point and Tanjong Labu, nearly 3½ miles westward, the coast is hilly and rocky. Punai is an islet 47 feet (14^m3) high, lying about midway between these two points and

Charts 2149, 941a, 1263.

Chart 3471.

half a mile offshore, and can generally be identified from a distance of about 6 miles; there are numerous above-water rocks between Punai and the coast. Tanjong Labu is fringed by large dirty white above-water rocks, having the appearance of houses when seen from a distance. A hill, 230 feet (70^{m}1) high, surmounted by a prominent tree, is situated about 1¼ miles eastward of this point.

The coast between Tanjong Labu (*Lat. 2° 58′ S., Long. 106° 20′ E.*) and Tanjong Limau, about 7 miles north-westward, is low, but there is a low range of hills a short distance inland; it is fringed by a bank which dries out as much as 1½ miles offshore. Daon is a small rocky islet, 30 feet (9^{m}1) high, which lies on the edge of this bank and about 7½ miles north-westward of Tanjong Labu; there are numerous above-water and sunken rocks between it and the coast.

Besar is a small islet, 63 feet (19^{m}2) high, surrounded by rocks, lying on the coastal bank which dries and extends about a quarter of a mile from a point about 5 miles west-north-westward of Daon. Pandjang, 286 feet (87^{m}2) high, situated nearly 3 miles north-westward of Daon, has a flat summit which can be seen from the south-eastward. Banka heuvel, 210 feet (64^{m}0) high, about 1¾ miles north-westward of Besar, has a flat summit when seen from the south-eastward and north-westward, and resembles Pandjang when viewed from the south-eastward. Kepang, 312 feet (95^{m}1) high, about 4½ miles east-north-eastward of Pandjang is round.

A light is exhibited, at an elevation of 196 feet (59^{m}7), from an octagonal iron framework tower, the lower part white, the upper part brown, and the cupola white, 194 feet (59^{m}1) in height, situated on Besar (*Lat. 2° 53′ S., Long. 106° 08′ E.*).

Between Tanjong Langgan and Tanjong Labu, the shore bank, with depths of less than 6 fathoms (11^{m}0) over it, extends between 6½ and 3¾ miles offshore, with depths of over 6 fathoms (11^{m}0) between it and the 3-fathom (5^{m}5) bank fronting the shore; from Tanjong Labu this bank trends north-westward to a position about one mile south-westward of Besar islet. There is a depth of 23 feet (7^{m}0) about 6 miles south-westward of Tanjong Ketapang, a depth of 23 feet (7^{m}0) about 5 miles westward of Tanjong Labu and a depth of 15 feet (4^{m}6) about 2 miles south-westward of Daon islet. Patches with depths of 6 feet (1^{m}8) and 3 feet (0^{m}9), sand, over them, lie about 3¼ miles south-eastward and westward, respectively, of Daon.

A light is exhibited, at an elevation of 36 feet (11^{m}0), from a black iron structure, 26 feet (7^{m}9) in height, situated about 3 miles south-south-westward of Tanjong Labu and on the shoalest part of a bank on the north-eastern side of Stanton passage.

On the south-western side of Stanton passage are Melvill bank and Smits bank. The shoalest part of the former is marked by a white beacon surmounted by a ball, situated about 6½ miles south-westward of Tanjong Labu; shoal ground, with depths of less than 3 fathoms (5^{m}5) over it, extends about 1½ miles south-eastward and about one mile north-westward from the beacon. There are several narrow ridges, with depths of less than 6 fathoms (11^{m}0) over them, between Melvill bank and Lucipara passage; those lying on the bank, with depths of less than 6 fathoms (11^{m}0) over it, extending eastward from Hindostan bank have been described on page 92. Smits bank, with a least depth of 2 feet (0^{m}6) over it, about 8¼ miles eastward of Tanjong

Charts 2149, 941a, 1263.

Chart 3471.

Djati (Eerste punt) (page 92), extends, with depths of less than 6 fathoms (11^{m}0), about 6 miles north-westward and 11 miles south-eastward from its shoalest part. A depth of 10 feet (3^{m}0) lies about 6¾ miles east-north-eastward of Tanjong Djati, and a depth of 15 feet (4^{m}6) lies about 8 miles north-north-eastward of Lucipara. A stony patch, with a depth of 6 feet (1^{m}8) over it, is situated about 8 miles east-south-eastward of Tanjong Djati, and a patch of sand, with a depth of 2 feet (0^{m}6) over it, lies about 2½ miles northward of the stony patch; depths of less than 3 fathoms (5^{m}5) extend for about 6½ miles south-eastward from the sandy patch. Passage between the banks westward of Melvill bank and eastward of Lucipara passage should not be attempted.

The Banka coast between Besar and Tanjong Panggung (Lelari), about 12½ miles west-north-westward, is marshy and fringed by a bank, which dries, extending over three-quarters of a mile offshore in places. Tanjong Panggung is a sharp, steep point, 75 feet (22^{m}9) high, with a prominent white beach. Depths of less than 6 fathoms (11^{m}0) extend for one mile south-westward from Tanjong Panggung. Balar, 253 feet (77^{m}1) high, an isolated, rounded hill about 6 miles east-north-eastward of Tanjong Panggung, is prominent.

A light is exhibited, at an elevation of 36 feet (11^{m}0), from a black iron beacon, 26 feet (7^{m}9) in height, situated close south-westward of Tanjong Panggung (*Lat. 2° 49′ S., Long. 105° 57′ E.*).

Nemesis bank, with a least depth of 10 feet (3^{m}0), forms the southern side of the passage here; it is marked by a light-buoy, painted black and white in horizontal bands, exhibiting a *white flashing* light showing *one* flash of *four seconds* duration *every sixteen seconds*, moored about 4 miles south-south-eastward of Tanjong Panggung. A detached shoal, with a least depth of 6 fathoms (11^{m}0) over it, lies off the north-western end of Nemesis bank and about 2½ miles southward of Tanjong Panggung. Another detached shoal, with a least depth of 6 fathoms (11^{m}0) over it, is situated off the south-western end of Nemesis bank and about 8¼ miles south-eastward of Tanjong Panggung.

Rede Toboali.—Toboali, the capital of a mining district, is situated on a hillock, about 40 feet (12^{m}2) high, close eastward of Tanjong Ketapang. A fort stands on the south-eastern side of the mouth of a small stream which flows out here, and the Government warehouses are outside this fort; the red roof of the barracks, westward of the flagstaff, is visible from a considerable distance. Boats can land on the northern side of a stone mole; the light on this mole is described on page 93.

The usual anchorage is in a depth of 3¾ fathoms (6^{m}9), mud, with Gadung in line with the fort, bearing 039°; the depths decrease regularly towards the shore. There is sometimes a heavy swell with southerly and south-westerly winds, and landing is troublesome. If making for Stanton passage from the roadstead, the leading mark given for anchoring also leads clear of the banks on the north-eastern side of this passage. The limits of the roadstead are within the arc of a circle described with a radius of 3 miles from the light-structure.

Toboali is in regular steamer communication with other ports in the Eastern Archipelago. The transport of goods in the roadstead is carried out by praus and lighters; it is advisable to give notice of the vessel's arrival so that praus are not delayed coming outside by low water.

Charts 2149, 941a, 1263.

Chart 3471.

Provisions and drinking water are obtainable in very limited quantities.

Medical assistance can be obtained.

MIDDLE PART OF STRAAT BANKA.—Tanjong Tapa (Tweede punt) (*Lat. 2° 41′ S., Long. 105° 47′ E.*), on the Sumatra coast and about 19 miles north-westward of Tanjong Kojan (page 92), has trees on it and must not be approached within depths of less than 12 fathoms (21^{m}9); the shore of the bight between these two points should not be approached within depths of less than 11 fathoms (20^{m}1). Tanjong Selokan (Derde punt), about 20 miles north-north-westward of Tanjong Tapa, is somewhat higher than the remainder of this coast; the mudbank, which extends some distance north-eastward from it, is steep-to and vessels must keep at a distance of at least one mile. The bight between Tanjong Tapa and Tanjong Selokan is entirely occupied by a soft, fairly steep-to mudbank, with depths of less than 3 fathoms (5^{m}5). The entire coast between Tanjong Kojan and Tanjong Selokan is low and covered with mangroves, except for the trees on the various points.

Fishing stakes are sometimes laid out near the one-fathom (1^{m}8) line off Tanjong Selokan.

The Banka coast between Tanjong Panggung and Tanjong Mentigi, about 5 miles northward, is marshy in the southern part and then changes to a sandy beach; Tanjong Mentigi is about 123 feet (37^{m}5) high. Riting, a sharp pointed hill, 328 feet (100^{m}0) high, lies about 3 miles eastward of Tanjong Mentigi. Tanjong Nunggul is about 2½ miles northward of Tanjong Mentigi. Tanjong Paritji and Tanjong Berani, about 4½ and 6 miles northward of Tanjong Mentigi, respectively, are both high and thickly wooded; there is a sandy beach between these two points. Tanjong Bedawu, about 3 miles northward of Tanjong Berani, is high and thickly wooded with dark coloured trees and has a prominent white rock, 45 feet (13^{m}7) high, close off it. Pemain, consisting of two dark masses of rock, covered with vegetation, lies about 2 miles north-north-westward of Tanjong Bedawu, but is difficult to identify from the north-westward. Tanjong Karak (Kara) is situated about 3 miles north-north-eastward of Tanjong Bedawu and has some above-water rocks close off it. Limau (Limaha), 466 feet (142^{m}0) high, is a conical hill situated about one mile east-south-eastward of Tanjong Berani, and a range of hills extends eastward from it; the Permisan gebergte lies eastward of Tanjong Bedawu, and the highest peak, 1,539 feet (469^{m}1) high, situated about 3 miles eastward of this point is very prominent. *See* view facing page 104.

Sungei Selan flows out nearly 10 miles northward of Tanjong Bedawu (*Lat. 2° 35′ S., Long. 105° 53′ E.*) and in the northern part of a shallow bay which is of no importance to shipping; Kampong Sungai Selan, the capital of a tin mining district, is situated about 10 miles up the river, and can be reached by small craft. The limits of the roadstead here are within the 5-fathom (9^{m}1) line between the lines drawn 191° and 236°, respectively, from the mouth of the river, but vessels usually anchor, in a depth of about 6½ fathoms (11^{m}9), clay, westward of the southern point of Groot Nangka and about 6 miles westward of the mouth of the river; cargo and passengers are conveyed to the village by small craft, but in the south-east monsoon communication with

Charts 2149, 941a, 1263.

Chart 3471.

such craft is generally dangerous. There is regular steamer communication with other ports in the Eastern Archipelago.

Tanjong Tedong, about 6 miles north-westward of the mouth of Sungei Selan, has a prominent hill on it, 233 feet ($71^{m}0$) high.

Islets and dangers.—Light.—Buoyage.—A shoal, with a least depth of 39 feet ($11^{m}9$) over it, lies about 4 miles west-north-westward of Tanjong Panggung (Lelari) light-structure (*Lat. 2° 49′ S., Long. 105° 57′ E.*).

Karang Tembaga, nearly 3 miles south-south-westward of Tanjong Berani, is a reef with three rocks, which dry, on it, the western being visible till nearly high water. A steep-to bank of hard substance, with depths of less than 3 fathoms ($5^{m}5$), extends fully 3 miles south-south-eastward from Karang Tembaga and about half a mile northward from it.

A spit of sand, stones and coral, with depths of less than 6 fathoms ($11^{m}0$) over it and a least depth of one foot ($0^{m}3$), extends nearly 4 miles westward from Tanjong Paritji. A depth of 6½ fathoms ($11^{m}9$) lies about 5 miles westward of the same point and at the eastern end of a spit, with depths of less than 10 fathoms ($18^{m}3$) over it, extending from Tanjong Tapa (Tweede punt) on the Sumatra coast; the depths in this vicinity are very irregular.

As there is an almost constant stream setting southward between these dangers and the Sumatra coast during the north-west monsoon, low-powered vessels make use of the inshore channel between Karang Tembaga and the Banka coast when proceeding northward at this season of the year.

A light-buoy, painted black, exhibiting a *white flashing* light showing *one* flash of *three seconds* duration *every twelve seconds*, is moored off the western end of the shoal spit extending westward from Tanjong Paritji and 2½ miles west-north-westward of Karang Tembaga.

Depths of 10 and 19 feet ($3^{m}0$ and $5^{m}8$) lie about 2¼ miles south-south-westward and 1½ miles westward, respectively, of Tanjong Bedawu; there are depths of 42 and 46 feet ($12^{m}8$ and $14^{m}0$) about 4½ miles west-south-westward and 4¼ miles south-westward, respectively, of the same point.

Foul ground extends about one mile southward from Pemain, situated about 2 miles north-north-westward of Tanjong Bedawu.

Nangka eilanden are three hilly islets lying on the coastal bank which extends about 4 miles south-westward from Tanjong Tedong. Groot Nangka, the south-eastern and largest island of the group, can be seen from a considerable distance; its summit, 289 feet ($88^{m}1$) high, appears cone-shaped when seen from the southward. A sandbank, which dries, extends about 2 miles south-eastward from Groot Nangka, and a reef, which dries and has some rocks above water on it, extends as much as 4 cables from the northern and eastern sides of the island; several dangerous rocks lie off its western side.

Gadung (Midden Nangka), 95 feet ($29^{m}0$) high, nearly 1¼ miles west-north-westward of the northern extremity of Groot Nangka, consists of two islets connected by a ridge of sand which only covers at exceptionally high water. Tikus (Klein Nangka) is a rock, 36 feet ($11^{m}0$) high, which lies midway between Gadung and Groot Nangka. Noord rif, a small portion of which is above water, is situated about 2 cables northward of Gadung, with some rocks which dry between.

Charts 2757, 2149, 941a, 1263.

Chart 3471.

Pelepasan (West Nangka), nearly half a mile west-north-westward of Gadung, is steep, rocky, difficult to approach and 138 feet (42m1) high. West rif, about 2 cables westward of Pelepasan, is partly above water.

A light is exhibited, at an elevation of 214 feet (65m2), from a white iron tower, 115 feet (35m0) in height, with a white dwelling having a red roof, situated on a hill on Pelepasan (*Lat. 2° 23′ S., Long. 105° 45′ E.*).

Anchorage can be obtained northward of Pelepasan, in depths of from 20 to 23 feet (6m1 to 7m0), with good holding ground, close to the coral reef. The anchorage for small vessels westward of the southern end of Groot Nangka is described on page 96.

A light-buoy, painted red, exhibiting a *white flashing* light showing *one* flash of *three seconds* duration *every twelve seconds*, is moored about 2 miles north-north-eastward of Tanjong Selokan (Derde punt) (page 96).

NORTHERN PART OF STRAAT BANKA.—Light.—The coast of Sumatra between Tanjong Selokan and Tanjong Katima Bongko (Vierde punt), about 24 miles westward, is covered with high trees. Several small rivers discharge along this coast, and Sungei Sugihan, close westward of Tanjong Selokan, is said to connect with Ayer Musi (Palembang rivier). The coastal bank consists of very soft mud, and can be safely approached to a depth of 7 fathoms (12m8); within about 5 miles of Tanjong Katima Bongko, however, the coastal bank becomes harder and steeper, and this point should, therefore, be given a good berth. Tanjong Katima Bongko has a few trees on it.

The coast between Tanjong Katima Bongko and Tanjong Gedeh, the eastern entrance point of Ayer Musi, about 18 miles westward is fronted by a bank of hard sand, covered by a thin layer of mud, with depths of less than 3 fathoms (5m5) over it, which extends as much as 8 miles offshore near Tanjong Gedeh. The eastern part of this bank is steep-to, and soundings of about 7 to 9 fathoms (12m8 to 16m5) can be obtained quite close to its outer edge; further westward the depths decrease more regularly towards the shore. Caution is necessary when navigating this part of the strait, and vessels must guard against the set, either in or out, from the mouths of the rivers. The Ayer Musi (Palembang rivier) is described on page 105, and the Banju Asin rivier on page 110.

The Banka coast between Tanjong Tedong (*Lat. 2° 22′ S., Long. 105° 48′ E.*) (page 97) and Tanjong Punei, about 33 miles west-north-westward, is indented by a bight in which the depths decrease regularly towards the shore, but it is of no importance to vessels passing through the strait. Sungei Sembulan flows out about 2 miles north-north-eastward of Tanjong Tedong, with a sandy beach between. From the mouth of this rivulet to about 3 miles eastward of Tanjong Raja, a high, rocky point about 16 miles north-north-westward, the coast is mostly marshy and covered with mangroves. Sungei Mendick and Sungei Kota Waringin flow into the bight about 8½ and 14 miles northward, respectively, of Tanjong Tedong. Mundo, 502 feet (153m0) high, situated about 7 miles northward of Tanjong Tedong and 1½ miles inland, and Tempilang, 571 feet (174m0) high, about 4 miles north-north-westward of Tanjong Raja are useful landmarks.

Charts 2757, 2149, 941a, 1263.

Chart 3471.

Mondong eilanden, about midway between Tanjong Tedong and Tanjong Raja, are some rocky islets, covered with vegetation, lying on a reef which dries and extends nearly 1½ miles westward from the coastal bank. Semedang, the eastern and highest islet, is 138 feet ($42^{m}1$) high, and can be seen from a considerable distance. Antu, close westward of Semedang, and Mundo, about 1¼ miles north-north-eastward of the latter, both cover at high water, leaving some large trees standing in the water. Batu Trumbu, the outermost islet, is 36 feet ($11^{m}0$) high; three rocks, which dry, lie close westward of Batu Trumbu.

The coast between Tanjong Raja (*Lat. 2° 08′ S., Long. 105° 40′ E.*) and Tanjong Resang, about 4½ miles westward, is high. Simonbong, about 1½ miles westward of Tanjong Raja, is a rocky islet, 171 feet ($52^{m}1$) high, lying on the coastal reef, which extends about three-quarters of a mile offshore here; it does not show up plainly against the land behind. Sungei Mantjong (Djering), with the village of Tandjung Niur on its eastern entrance point, flows out about 3 miles north-north-westward of Tanjong Resang; numerous rocks fringe the high coast between this point and the village. The western bank of the river is low and covered with mangroves.

The coast between the western entrance point of Sungei Mantjong and Tanjong Tada, about 8 miles west-south-westward, is low and is fringed by a coastal bank, with depths of 6 feet ($1^{m}8$), or less, which extends, for nearly 3 miles by the mouth of the river and gradually narrows westward. Tanjong Tada has a hill on it, 184 feet ($56^{m}1$) high, and is prominent from southward. Tanjong Aniai and Tanjong Sukal, about 3 and 6 miles westward of Tanjong Tada, respectively, are high, prominent, rocky points; Tanjong Sukal is easy to distinguish by its two conical hillocks, 214 feet ($65^{m}2$) and 233 feet ($71^{m}0$) high. Karang Seribu, with some rocks above water on it, lies about one mile southward of Tanjong Aniai. Tanjong Punei is a low, rounded point. Asin, 656 feet ($200^{m}0$) high, is situated about 10¾ miles northward of Tanjong Tada.

Chart 3471, with plan of Rede Muntok.

The coast between Tanjong Punei and Tanjong Kelian, about 11½ miles west-north-westward, consists of soft mud, with trees standing in the water; Tanjong Kelian is low and sandy. The coast here is subject to constant erosion, and the position fixed for the lighthouse on Tanjong Kelian in 1856 was in the sea in 1859, whilst in 1862 there was a depth of 14 fathoms ($25^{m}6$) over it. For the description of Rede Muntok, *see* page 101. Menumbing, 1,473 feet ($449^{m}0$) high, about 5 miles north-eastward of Tanjong Kelian, is the highest peak of a range of hills, and has a blunt summit; the slopes of these hills are covered with imposing masses of granite, with vegetation between.

The hills Belo, 781 feet ($238^{m}0$) high, Pandjang, 801 feet ($244^{m}1$) high, and Batu, 706 feet ($215^{m}2$) high, lie, respectively, about 10 and 11¾ miles east-north-eastward and 16½ miles north-eastward of Tanjong Kelian.

A light is exhibited, at an elevation of 171 feet ($52^{m}1$), from a stone tower, the upper part red and the lower part white, 164 feet ($50^{m}0$) in height, situated on Tanjong Kelian (*Lat. 2° 05′ S., Long. 105° 08′ E.*).

An oil pier, about 394 feet ($120^{m}1$) long, with a depth of 23 feet ($7^{m}0$) at its head, and privately maintained, extends south-eastward

Charts 2757, 2149, 941a, 1263.

Chart 3471, with plan of Rede Muntok.

from a position on the coast nearly one cable eastward of the lighthouse; it is only suitable for small vessels and is not for public use.

Chart 3471.

Dangers.—Buoyage.—Beacon.—The shore bank, with depths of less than 6 fathoms ($11^{m}0$) over it, extends between 2 and $3\frac{1}{4}$ miles offshore between Tanjong Selokan (Derde punt) and a position about 9 miles west-north-westward; from this latter position a spit, with depths of less than 6 fathoms ($11^{m}0$), extends in a west-north-westerly direction to a position about $6\frac{1}{2}$ miles eastward of Tanjong Katima Bongko (Vierde punt) and $3\frac{1}{2}$ miles offshore. A least depth of 23 feet ($7^{m}0$) lies $9\frac{1}{2}$ miles eastward of Tanjong Katima Bongko and $2\frac{1}{4}$ miles offshore. A shoal, with a least depth of 19 feet ($5^{m}8$) over it, lies in the fairway about 4 miles north-eastward of Tanjong Katima Bongko, and depths of less than 6 fathoms ($11^{m}0$) extend about $1\frac{1}{4}$ miles west-north-westward and $1\frac{3}{4}$ miles east-south-eastward from its shoalest part.

North-westward of Tanjong Katima Bongko the 6-fathom ($11^{m}0$) line extends as much as $11\frac{1}{2}$ miles offshore north-north-eastward of Tanjong Gedeh. A spit, with depths of less than 10 fathoms ($18^{m}3$) over it, extends north-north-westward from a position about $5\frac{1}{2}$ miles north-westward of Tanjong Katima Bongko to a position about 5 miles south-westward of Tanjong Kelian. Two patches, with a least depth of 39 feet ($11^{m}9$) over each of them, lie about $5\frac{1}{2}$ miles south-south-westward and 5 miles south-westward of Tanjong Kelian.

A shoal, with a least depth of 29 feet ($8^{m}8$) over it, is situated about $7\frac{1}{2}$ miles southward of Tanjong Tada (page 99) and nearly in the middle of the strait; depths of less than 6 fathoms ($11^{m}0$) extend about 3 miles north-westward from this patch, and depths of 33 feet ($10^{m}1$) and 36 feet ($11^{m}0$) lie about $1\frac{1}{2}$ and $2\frac{1}{2}$ miles, respectively, eastward of the same patch.

Karang Brom Brom extends 4 miles eastward and 5 miles east-north-eastward from a position about 4 miles southward of Tanjong Punei (*Lat. 2° 09′ S., Long. 105° 19′ E.*); its western part consists of sand and black rocks, which dry in places, whilst there are depths of 23 feet ($7^{m}0$) in the eastern part. Depths of less than 6 fathoms ($11^{m}0$) extend about three-quarters of a mile southward and westward from the drying part of the shoal, and this shelf is steep-to on its southern and south-western sides.

A black beacon, surmounted by a cone, stands on the western part of Karang Brom Brom; a tree, which is more conspicuous than the beacon, is situated about 4 cables south-eastward of the beacon. There is a channel, about one mile wide, with depths of from $6\frac{1}{2}$ to 13 fathoms ($11^{m}9$ to $23^{m}8$), which narrows to about half a mile wide $5\frac{1}{2}$ miles east-north-eastward of the beacon, between the northern side of Karang Brom Brom and the coastal bank which extends along the Banka shore. As there is an almost constant stream setting eastward along the Sumatra shore during the north-west monsoon, this channel is frequently used by small low-powered vessels proceeding westward.

Two detached 6-fathom ($11^{m}0$) patches, lie about 3 miles southward and south-westward of Karang Brom Brom beacon.

Chart 3471, with plan of Rede Muntok.

Amelia bank, Muntok bank and Karang Hadji lie on the south-western side of a channel, with depths of from 10 to 31 fathoms ($18^{m}3$

Charts 2757, 2149, 941a, 1263.

Chart 3471, with plan of Rede Muntok.

to $56^{m}7$), which extends from a position about 3 miles south-westward of Tanjong Punei to 2 miles west-north-westward of Tanjong Kelian. The passage between these banks and the Banka coast is safe and used by vessels proceeding to and from Rede Muntok (*Lat. 2° 05′ S., Long. 105° 10′ E.*).

Amelia bank, consisting of hard sand, with a least depth of 15 feet ($4^{m}6$) over it, in position 5½ miles south-westward of Tanjong Punei, extends, with depths of less than 6 fathoms ($11^{m}0$), for about 1½ miles south-eastward and 3½ miles north-westward from its shoalest part.

Muntok bank, consisting of hard sand, with a least depth of 13 feet ($4^{m}0$) over it, in position 6½ miles west-south-westward of Tanjong Punei, extends, with depths of less than 6 fathoms ($11^{m}0$), for about 2¼ miles east-south-eastward and 6½ miles north-westward from its shoalest part; a depth of 15 feet ($4^{m}6$) lies near its north-western end and about 1¾ miles southward of Tanjong Kelian.

The passage between Amelia bank and Muntok bank should not be attempted.

A conical light-buoy, painted black and exhibiting a *red flashing* light showing *one* flash of *three seconds* duration *every twelve seconds*, is moored near the north-western end of Muntok bank about 2 miles south-south-eastward of Tanjong Kelian. There is a narrow channel across Muntok bank about three-quarters of a mile south-eastward of the above light-buoy, *see* Directions for Rede Muntok on page 102.

Karang Hadji lies with its eastern extremity nearly 2 miles south-westward of Tanjong Kelian and has some large black rocks on it; it extends for about 3½ cables north-westward from its eastern extremity. A drying shoal is situated between 2 and 9 cables east-south-eastward of the eastern end of Karang Hadji. A detached reef, with a least depth of 11 feet ($3^{m}4$) over it, lies about 5 cables north-eastward of the northern side of Karang Hadji and is marked, on its northern side, by a white conical buoy with ball topmark. A black can buoy, with conical topmark, marks a 13-foot ($4^{m}0$) patch nearly one mile north-westward of Tanjong Kelian.

The light-structure on Tanjong Kelian in line with the summit of Menumbing (page 99) leads south-eastward of the drying shoal off the south-eastern extremity of Karang Hadji and close north-westward of the 15-foot ($4^{m}6$) patch near the northern end of Muntok bank. Tanjong Besajap, about 4 miles north-north-westward of Tanjong Kelian, in line with the light-structure on Tanjong Ular, *see* page 103, leads close westward of Karang Hadji.

Rede Muntok. — Lights. — Anchorages. — Prohibited anchorage.—Muntok, situated about 2 miles east-north-eastward of Tanjong Kelian, is the headquarters of a Government official. The native town is built by the mouth of the Sungei Muntok, a stream which flows out here; the Chinese quarter is higher up, on the road leading from the lower town to the upper or European part, which contains the barracks, hospital, post office, etc. The climate is considered unhealthy.

There is a small harbour of refuge for praus, about 2 cables westward of the mouth of the Sungei Muntok; in 1950 there was reported to be a depth of 13 feet ($4^{m}0$) in this harbour and 5 feet ($1^{m}5$) in the entrance. A light is exhibited, at an elevation of 15 feet ($4^{m}6$), from a white iron beacon, 10 feet ($3^{m}0$) in height, on the root of the pier about one cable eastward of the entrance to the prau harbour.

Charts 2757, 2149, 941a, 1263.

Chart 3471, with plan of Rede Muntok.

The roadstead consists of the sea area within 5 miles of Tanjong Kelian lighthouse (*Lat. 2° 05′ S., Long. 105° 08′ E.*), eastward of the meridian of longitude passing through it. Large vessels can obtain good anchorage, in depths of from 5 to 12 fathoms ($10^{m}1$ to $21^{m}9$), soft mud, from about $1\frac{1}{4}$ to $1\frac{3}{4}$ miles offshore, with the summit of Menumbing bearing 012°, and Tanjong Kelian bearing between 282° and 293°. Small vessels can anchor from about 5 to 6 cables southward of the light-structure at Muntok, in a depth of about 23 feet ($7^{m}0$); when approaching this anchorage it must be borne in mind that a shoal, with a least depth of 9 feet ($2^{m}7$) over it, extends from a position about 3 cables eastward of Tanjong Kelian to a position about one mile southward of the light-structure at Muntok and 2 miles eastward of Tanjong Kelian (*Lat. 2° 05′ S., Long. 105° 08′ E.*).

Loading and unloading is carried out by praus, and it is advisable to give notice of the probable time of arrival so that the praus can be ready. The transport of personnel is carried out by a regular ferry service.

A pontoon, 200 feet ($61^{m}0$) long and 60 feet ($18^{m}3$) wide, is moored nearly $2\frac{1}{4}$ miles south-eastward of the light-structure at Muntok; it is lighted at night, and there are numerous mooring buoys in the vicinity. It is used by oil tankers which, due to their draught, cannot cross the bar of the Ayer Musi with a full load; such vessels moor alongside the pontoon with head and stern secured to mooring buoys and complete to full cargo from another tanker berthed on the opposite side of the pontoon.

Passing vessels must give the pontoon a berth of at least one mile and anchorage is prohibited within a circular area of 5 cables radius round the pontoon, indicated by a pecked line on the chart.

Harbour facilities.—Fresh provisions, fuel and water are not available. There is a hospital and a harbour doctor.

There is regular steamer communication with other ports in the Eastern Archipelago, and native vessels run frequently to Palembang and other places in Straat Banka. Muntok is connected to the general telegraph system and to the district telephone system.

Chart 3471.

Directions.—Vessels bound for Rede Muntok from eastward can use the clear channel northward of Karang Brom Brom, Amelia bank, and Muntok bank. If passing southward and westward of Karang Brom Brom and eastward of Amelia bank, the summit of Belo (page 99) bearing 355° leads about one mile clear of Karang Brom Brom.

The roadstead can be approached from southward by steering for the summit of Menumbing in line with the flagstaff on the fort at Muntok, bearing 019°; this leading line leads close eastward of the light-buoy moored near the north-western end of Muntok bank, in a depth of about $5\frac{1}{2}$ fathoms ($10^{m}1$), and the depths increase rapidly to about 21 fathoms ($38^{m}4$), soft mud, when inside Muntok bank.

Vessels from Palembang can approach the roadstead, or pontoon, by steering for the summit of Belo in line with the pontoon, bearing $051\frac{1}{2}$°; this leading line leads about three-quarters of a mile south-eastward of the light-buoy, mentioned above, in a least depth of about $5\frac{1}{2}$ fathoms ($10^{m}1$).

Vessels from northward, bound for Rede Muntok, can use the buoyed channel between Karang Hadji and Tanjong Kelian; owing to the

Charts 2757, 2149, 941a, 1263.

Chart 3471.

great depths and bad holding ground, anchorage is not possible in this channel.

NORTHERN ENTRANCE TO STRAAT BANKA.—Light.—Batakarang punt, on the western side of the northern entrance to Straat Banka, is the general name of the rounded part of the Sumatra coast immediately northward of the entrance to the Banju Asin rivier; it is made prominent by the trees upon it, which are high right down to the sea and which give it a jagged appearance. The mud bank which extends from the coast here is continually extending, gradually narrowing the passage between the point and Frederik Hendrik klippen; the depths are, however, regular, and the coast can be safely approached to within depths of 5 or 6 fathoms (9^{m}1 or 11^{m}0).

Tanjong Berani (*Lat. 2° 04′ S., Long. 105° 07′ E.*), on the Banka coast and about 7 cables north-north-westward of Tanjong Kelian, is rocky and 125 feet (38^{m}1) high. Tanjong Besajap, about 3½ miles northward of Tanjong Berani, is also rocky and is 164 feet (50^{m}0) high. The coast between these two points is fronted by a bank, with depths of less than 3 fathoms (5^{m}5), which extends as much as 1¼ miles offshore. Besajap, 322 feet (98^{m}1) high, about 1¼ miles east-north-eastward of Tanjong Besajap, appears rounded when seen from westward. *See* view facing page 105. Tanjong Ular, nearly 4 miles north-north-eastward of Tanjong Besajap, is a rocky point, 154 feet (46^{m}9) high; a prominent sandy beach fronts the high trees northward and southward of the point. The coast between Tanjong Besajap and Tanjong Ular is fringed by a reef, which extends about three-quarters of a mile from Tanjong Ular and is steep-to. This part of the coast must be given a wide berth, owing to the reefs off it. The coast north-eastward of Tanjong Ular is described on page 111.

A light is exhibited, at an elevation of 49 feet (14^{m}9), from a white iron structure, 39 feet (11^{m}9) in height, situated on Tanjong Ular.

Dangers.—Frederik Hendrik klippen lie nearly in the middle of the northern entrance to Straat Banka and about 10 miles westward of Tanjong Ular; they consist of two rocky patches, with a depth of 8 feet (2^{m}4) on the northern, and 3 feet (0^{m}9) on the southern.

A 33-foot (10^{m}1) patch is situated about 5 miles east-south-eastward of Frederik Hendrik klippen and midway between these rocks and Tanjong Besajap (*Lat. 2° 01′ S., Long. 105° 06′ E.*).

A rock awash lies nearly 2½ miles south-westward of Tanjong Ular, and between this rock and the coastal reef is a reef which dries.

Karang Sebidung Uma, nearly 2 miles northward of Tanjong Ular, is a steep-to reef with some rocks awash on it; this reef is not marked by discoloration, and sounding gives no warning of approaching it. A shoal, with a depth of 11 feet (3^{m}4) over it, lies about 3 miles northward of Tanjong Ular and 2 miles offshore; depths of less than 18 feet (5^{m}5) extend for about 3 cables eastward from this shoal.

DIRECTIONS FOR STRAAT BANKA.—General remarks.—The attention of mariners is particularly drawn to the caution on page 90, bearing in mind that the charts, as far as the Sumatra coastline is concerned, may not accurately represent the contour off this coast as it actually is at the present time.

The tidal streams (*see* page 90) set strongly along the various points

Charts 2757, 2149, 941a, 1263.

Chart 3471.

in the strait, so that none of these must be rounded closely. Heavy driftwood, which is brought down by the rivers during the rainy season, must be avoided; the bows of vessels are frequently damaged by this.

Northward through Straat Banka.—*Stanton passage.*—A vessel approaching the entrance to Straat Banka from southward will usually find it difficult to identify any of the landmarks shown on the charts, except the summit of Sint Paul (page 93), Gadung (page 93) and Lama (page 93), which latter is plainly visible at a distance of 30 miles; *see* view facing page 105.

As soon as Lama is identified it can be steered for on a north-north-westerly bearing, keeping clear of the 29-foot ($8^{m}8$) patch about 7 miles southward of Dapur eilanden, *see* page 93, until the light-structure on those islands is sighted. When about 4 miles south-south-eastward of this light-structure a west-north-westerly course can be steered for the entrance to Stanton passage so as to bring Balar (*Lat. 2° 47′ S., Long. 106° 02′ E.*) in line with the light-structure on Besar, bearing about 315°, which will lead through the fairway between the beacon on Melvill bank and the light-beacon on the bank on the north-eastern side of the passage. When past Melvill bank course can be altered west-north-westward, so as to pass northward of Smits bank and the light-buoy marking Nemesis bank. The light-beacon off Tanjong Panggung (Lelari) should be given a wide berth, as the coastal bank extends some distance outside it; *see* page 95 for 6-fathom ($11^{m}0$) patch about 2½ miles southward of Tanjong Panggung.

From Tanjong Panggung course should be shaped to pass about midway between the mudbank which extends from Tanjong Tapa (Tweede punt) and the light-buoy marking the shoals north-westward of Karang Tembaga (page 97), *see* page 97 for 39-foot ($11^{m}9$) patches about 4 miles west-north-westward of Tanjong Panggung and 2½ miles east-north-eastward of Tanjong Tapa. Course should then be steered to pass midway between Tanjong Selokan (Derde punt) and the Nangka eilanden, and thence north-eastward of the light-buoy moored about 2 miles northward of Tanjong Selokan. A westerly course may then be steered to pass southward of Amelia bank, bearing in mind that a shoal, with a depth of 19 feet ($5^{m}8$) over it, lies about 4 miles north-eastward of Tanjong Katima Bongko (Vierde punt). When Menumbing heuvel bears 000°, a north-westerly course may be steered, bearing in mind that the tidal streams set strongly across the channel between Tanjong Katima Bongko and Batakarang punt; care should be taken to avoid the obstruction charted about 4 miles south-westward of Tanjong Kelian (*Lat. 2° 05′ S., Long. 105° 08′ E.*). When Menumbing heuvel is in line with the lighthouse on Tanjong Kelian, bearing about 037°, course should be altered northward so as to pass eastward of Frederik Hendrik klippen; *see* page 103 for 33-foot ($10^{m}1$) patch about 5 miles east-south-eastward of those rocks.

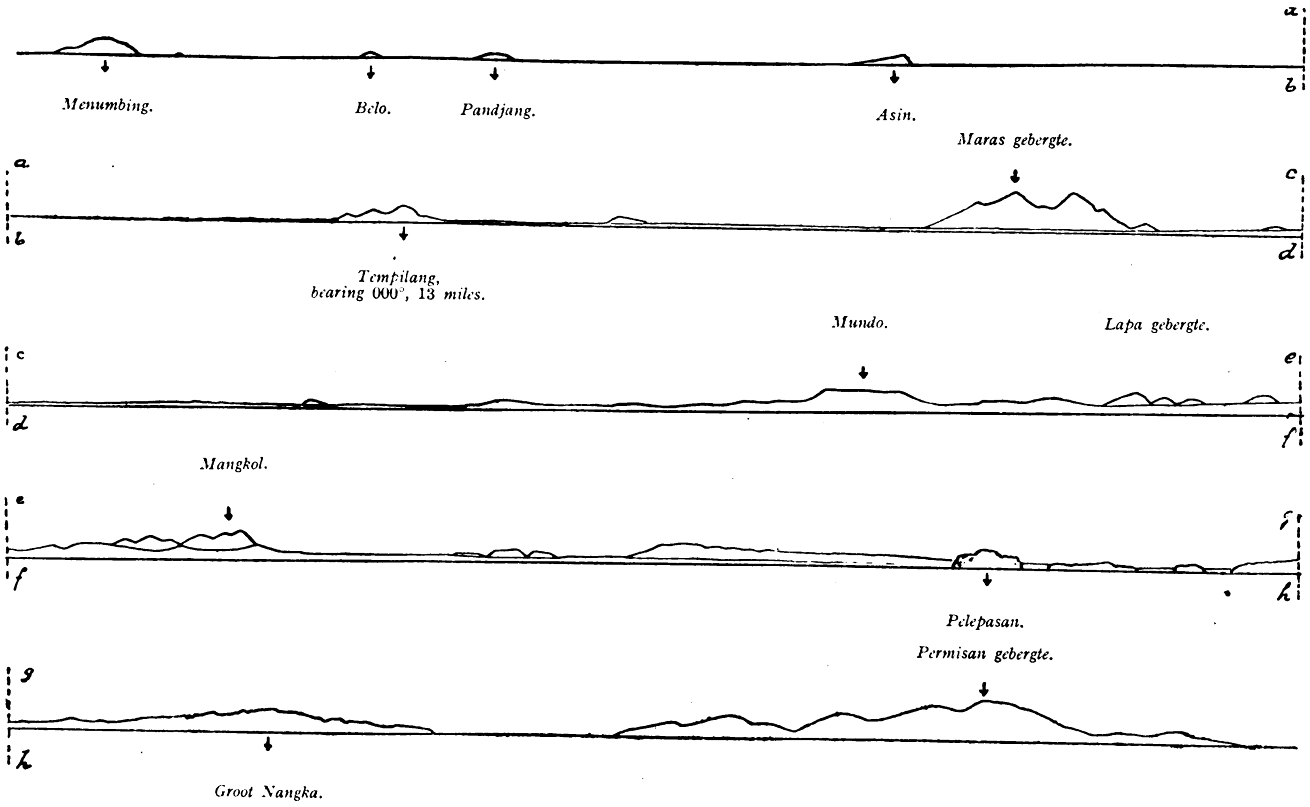
Lucipara passage.—Lucipara passage is unmarked and is not recommended; no directions will, therefore, be given.

Charts 3471, 2757.

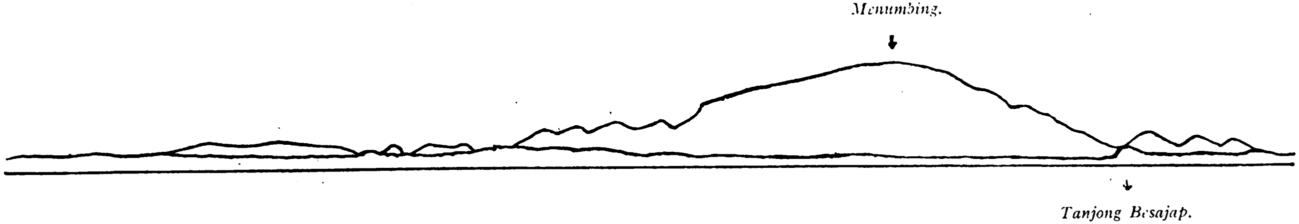
Making Straat Banka from the northward.—A vessel having passed the Tudju eilanden, situated about 45 miles north-north-eastward of the northern entrance to Straat Banka, can easily fix her position in clear weather by bearings of Penjabung (page 112), Menum-

Charts 2149, 941a, 1263.

To face page 104.

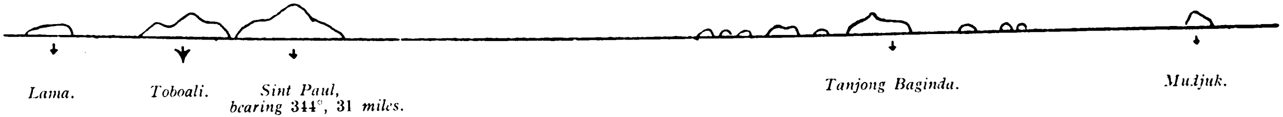


View, in 5 parts, of western coast of Banka, from north-westward of Nangka eilanden.
(Original dated 1949.)



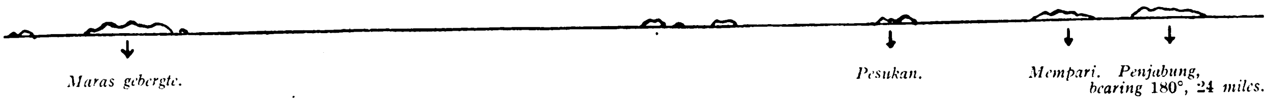
Banka, north-western coast, from near Frederik Hendrik klippen.

(Original dated 1949.)



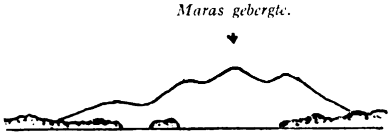
Southern approach to Straat Banka from north-eastward of Five Fathom banks.

(Original dated 1949.)



Northern approach to Straat Banka from south-eastward of Tudju eilanden.

(Original dated 1949.)



Entrance to Klabat baai: Summit of Maras gebergte bearing 143°, 26 miles.

(Original dated 1929.)

Charts 3471, 2757.

bing, and other conspicuous landmarks on the north-western and northern coasts of Banka; *see* view facing page 105.

In ordinary circumstances vessels usually enter the strait by the channel eastward of Frederik Hendrik klippen. In thick weather, however, it frequently happens that no land can be seen until the vessel has arrived close off the entrance to the strait; in such cases it is advisable to make for the Sumatra coast by sounding, and follow the edge of the coastal bank, sounding continuously, in depths of from 6 to 8 fathoms ($11^{m}0$ to $14^{m}6$).

Charts 3476, 3471.

AYER MUSI.—The Ayer Musi (Palembang rivier) rises near Gunong Kaba, a volcano situated north-eastward of Benkulen, and flows into Straat Banka about 18 miles westward of Tanjong Katima Bongko, forming a delta. Upang rivier and Saleh rivier, the two eastern mouths of the delta, are not navigable. The channel in Ayer Musi, which is subject to frequent change, *see* below, is navigable by sea-going vessels to about 6 miles above Palembang, situated about 50 miles above the mouth; the navigable portion of the river above Palembang is available for vessels with a draught of 22 feet ($6^{m}7$). In the west monsoon, from December to April, small craft with a draught of 3 feet ($0^{m}9$) can proceed up to Muara Klingi, 160 miles above Palembang (*Lat. 2° 59′ S., Long. 104° 46′ E.*).

Chart 3476.

The Ayer Musi is entered between Tanjong Gedeh (page 98) and Tanjong Tjarat about 3 miles northward. Pajung, an island a short distance within the entrance, divides the river into two navigable channels, *see* Regulations on page 108. Beruk is an islet in the western of these two channels.

Depths.—In 1952 there was a least depth of 11 feet ($3^{m}4$) on the outer bar, off the mouth of the river. Isolated shoals of 6 feet ($1^{m}8$) and 5 feet ($1^{m}5$), however, lie on the outer leading line, about 4 and 8 cables north-eastward, respectively, of its intersection with the inner leading line.

The approximate least depths in the fairway of the river are as follows:—

In the channel eastward of Pajung	13 feet ($4^{m}0$) in 1952.
In the channel westward of Pajung	15 feet ($4^{m}6$) in 1953.
In the channel southward of the light-buoy southward of Pajung	13 feet ($4^{m}0$) in 1952.
On the bar below Upang village (23 miles above Pajung)	15 feet ($4^{m}6$) in 1949.
On the bar below Peradjin (9 miles below Palembang)	17 feet ($5^{m}2$) in 1950.
On the bar below Sungei Lais (opposite Kundur, 5½ miles below Palembang) ..	18 feet ($5^{m}5$) in 1949.

The depths at mean water level are 6 feet ($1^{m}8$) more than those given above.

The times of high and low water occur approximately one hour later for every 12 miles upstream, thus:—

H.W. and L.W. on the bar	abreast Pajung	1 hr.	later than on the outer bar.
,, ,, ,,	above Upang village	2¾ hrs.	
,, ,, ,,	below Peradjin village	3¼ hrs.	
,, ,, ,,	off Pladju..........	4 hrs.	

Charts 3471, 2149, 941a.

Chart 3476.

Tide gauges.—Tide gauges have been placed in the river in the positions given hereafter; they are divided in feet, the even feet numbers only being given, and the lower edge of the number indicates the depth. As these gauges were placed on trial, in 1933, there may be some discrepancy between the depth given by a gauge and the actual depth on the position for which the gauge is installed; caution must, therefore, be exercised by vessels of extreme navigable draught navigating the river. In 1950, the tide gauges, where they still existed, could not be read by passing vessels.

The positions of the tide gauges are as follows:—

About 4¾ miles south-south-westward of Tanjong Tjarat (*Lat. 2° 17′ S., Long. 104° 55′ E.*), on the northern side of the entrance to Telang rivier.

On the eastern side of the river about one mile southward of the entrance to Upang rivier.

At Peradjin, on the eastern side of the river.

Tidal streams.—The tidal streams in Ayer Musi are of a mixed character, sometimes semi-diurnal, but frequently diurnal; there is, however, insufficient information to give an accurate description. The average rate of the ebb stream is usually 2 knots, and that of the flood stream from one to 1½ knots; slack water is of short duration. The flood stream is frequently felt as far up as Palembang, and vessels lying off the town usually swing half an hour after high or low water by the shore; the surface water changes direction first, so that shallow-draught vessels swing before those of deeper draught. If little rain falls in the interior there are sometimes two tides a day, although this is exceptional as the town lies too far from the mouth. During the rainy season, from November to March, there is sometimes no flood stream at Palembang for days at a time.

Pilotage.—Pilotage is compulsory, with a few exceptions, and the pilots are obtained from the pilot light-vessel. Vessels bound for the Banju Asin rivier, and the Ayer Lalang, to Muara Bahar, must display the Code pendant of the International Code of Signals below the signal for a pilot as specified in the International Code of Signals; the latter signal without the Code pendant denotes that a pilot is required for Palembang.

The pilot signal must be displayed until the pilot is taken on board or an answering signal has been made. Vessels arriving at night, and not wishing to enter until daylight, must first display the pilot signal at daybreak. The pilot light-vessel will answer the pilot signal in the following manner:—

Signal.	*Signification.*
(1) At night: a flare just above the bulwarks or swinging a *white* light.	The pilot will proceed to the vessel as soon as possible.
(2) By day: Flag D of the International Code of Signals, or a black ball with a black cone, point upwards, below it. At night: a *red* light above a *white* light.	There is no pilot available on board the pilot light-vessel; the vessel may enter without a pilot until one is met.

Charts 3471, 2757, 2149, 941a.

Signal.	*Specification.*
(3) At night: A *green* light above a *white* light.	The pilot will board the vessel from a pulling boat, the weather being unsuitable for a motor boat.

Masters of vessels bound for Ayer Musi should inform the Harbour master at Palembang by radio, 24 hours in advance, of the draught of the vessel and the expected time of arrival at the pilot light-vessel.

At Palembang it is compulsory to take the Harbour pilot.

Pilot light-vessel.—Radio.—A pilot light-vessel, painted black, with *Palembang* in white on her sides, is moored about 6 miles north-north-eastward of Tanjong Tjarat (*Lat. 2° 17′ S., Long. 104° 55′ E.*); the vessel has two masts and exhibits a light, at an elevation of 66 feet ($20^{m}1$), from the foremast. There is a radio station at the light-vessel through which masters of vessels can report their expected time of arrival at Palembang.

Prohibited anchorage.—Anchorage is prohibited within an area, of 2½ cables radius, with its centre situated about 6 miles north-north-eastward of Tanjong Tjarat and close south-westward of the light-vessel.

Lights.—Buoyage.—A green conical light-buoy, exhibiting a *green flashing* light *every sixteen seconds*, is moored on the north-western side of a stranded wreck which lies about 1¼ miles north-eastward of the light-vessel and about 7 miles north-north-eastward of Tanjong Tjarat.

Two pairs of leading lights are exhibited from white iron framework beacons on the outer bar off the entrance to the Ayer Musi. The front beacon of the southern pair is situated about 2¾ miles northward of Tanjong Tjarat, and exhibits a light at an elevation of 18 feet ($5^{m}5$); the rear beacon is situated about three-quarters of a mile south-westward of the front beacon, and exhibits a light at an elevation of 42 feet ($12^{m}8$). These two lights are in line bearing about 217°, and lead over the northern part of the bar from the pilot light-vessel to the leading line of the second pair.

The front beacon of the northern pair is situated about 4 miles northward of Tanjong Tjarat, and exhibits a light at an elevation of 18 feet ($5^{m}5$); the rear beacon is situated about 6 cables northward of the front beacon, and exhibits a light, at an elevation of 42 feet ($12^{m}8$). These two lights are in line bearing about 005°, and lead over the southern part of the bar to the entrance to the river.

A light-buoy, painted black, exhibiting a *red flashing* light, showing *one* flash of *five seconds* duration *every twelve seconds*, is moored on the eastern side of the channel over the outer bar and about 3½ miles north-north-eastward of Tanjong Tjarat and near the junction of the entrance leading lines.

A light-buoy, painted white, exhibiting a *white flashing* light, showing *one* flash of *five seconds* duration *every twelve seconds*, is moored on the western side of the channel southward of the bar and about 1½ miles northward of Tanjong Tjarat (*Lat. 2° 17′ S., Long. 104° 55′ E.*).

A light-buoy, painted white, exhibiting a *white flashing* light, showing *one* flash of *five seconds* duration *every twelve seconds*, is moored about three-quarters of a mile northward of the northern end of Pajung;

Chart 3476.

this light-buoy marks the western side of the northern entrance to the channel eastward of Pajung, which is used by in-coming vessels.

The channel westward of Beruk, off the western side of Pajung, used by out-going vessels, is marked by a light-buoy, painted black, exhibiting a *white flashing* light, showing a *short* flash *every three seconds*, moored about a quarter of a mile north-westward of Beruk.

Leading beacons are situated on the southern end of Pajung, and on Beruk. The channels eastward of Pajung and westward of Beruk, and of the river southward to Palembang, are marked by light-buoys and buoys, and by light-beacons and beacons fitted with reflectors. No reliance can be placed on the existence of reflectors on the beacons and crossing-over marks. Local knowledge for the navigation of these channels is necessary, *see* **Pilotage,** page 106.

Regulations.—In-coming vessels should enter the river by the channel eastward of Pajung.

Out-going vessels must always use the channel westward of Pajung, passing westward of Beruk and westward of the light-buoy moored about a quarter of a mile north-westward of that island.

Between two hours and one hour before high water, in-coming vessels have priority over out-going vessels in crossing the outer bar off the mouth of the river. During the period between two hours and three-quarters of an hour before high water, outward bound vessels should wait between Tanjong Gedeh and Tanjong Tjarat. With the exception of this period, out-going vessels have priority.

Directions.—To cross the outer bar, from the pilot light-vessel a vessel should keep the southern pair of light-beacons, situated about 2½ miles northward of Tanjong Tjarat (*Lat. 2° 17′ S., Long. 104° 55′ E.*), in line bearing about 217°, until the northern pair of light-beacons, situated about 4 miles northward of Tanjong Tjarat, are in line, when they should be kept in line astern, bearing about 005°; the vessel should pass close westward of the light-buoy, painted black, moored near the intersection of these two leading lines. Thence she should pass close eastward of the light-buoy, painted white, moored about 1½ miles northward of Tanjong Tjarat.

It must be borne in mind, however, that the outer leading line passes over the 6- and 5-foot ($1^{m}8$ and $1^{m}5$) patches about 4 and 8 cables north-eastward of its intersection with the inner leading line.

Rede Palembang.—Rede Palembang is the portion of the Ayer Musi which lies between the line drawn 000° from the eastern entrance point of Sungei Kundur, about 5 miles below Palembang, and the line drawn 030° from a position on the right bank of the Ayer Musi situated about 8 cables westward of the western entrance point of Ayer Kramasan, situated a few miles above the town of Palembang. Except for Belawan, it is the most important harbour on the eastern coast of Sumatra.

The Government wharf, named Nieuwe Boom, is situated on the northern bank of the river and about one mile east-north-eastward of the flagstaff at the Resident's house (*Lat. 2° 59′ S., Long. 104° 45′ E.*); it is 820 feet ($249^{m}9$) in length, and can accommodate vessels with a draught of from 20 to 23 feet ($6^{m}1$ to $7^{m}0$) alongside at all times. At this wharf the ebb stream sets into the shore.

Pladju, situated southward of the eastern extremity of Kemara and on the western side of the mouth of Ayer Komering, is a shipping

Charts 3471, 2757, 2149, 941a.

station for oil. Wharves for shipping oil, with a least depth of 23 feet ($7^{m}0$) alongside, are situated at Pladju, at Sungei Gerong, on the eastern side of the mouth of Ayer Komering, and at Bagus Kuning, nearly 1½ miles above Pladju; No. 5 pier at Sungei Gerong, however, has an obstruction on its eastern side, over which there is a least depth of 12 feet ($3^{m}7$).

Kartapati, a terminus on the Sumatra railway system, is situated on the right bank at the upper end of the town. There is a wharf here, 738 feet ($224^{m}9$) in length, with a least depth of 20 feet ($6^{m}1$) alongside; two cranes, each with a lifting power of 6 tons, and one, with a lifting power of 5 tons, stand on this wharf. Coal can be loaded at this wharf.

Palembang is the headquarters of a Government official, and is built on both sides of the river. The European quarter, containing the Residency and offices, is on the northern bank; the Chinese quarter is on the southern bank.

Anchorages.—Large tankers and cargo vessels normally anchor in the channel off Sungei Gerong and Pladju while waiting to go alongside wharves or while waiting for a favourable tide before proceeding down river. In this anchorage the depths are from 19 to 33 feet ($5^{m}8$ to $10^{m}1$), mud and sand, providing good holding ground, and there is ample room for swinging.

Smaller vessels proceeding to Palembang or Kartapati may anchor anywhere in the channel except in the vicinity of the prohibited anchorages.

Prohibited anchorages.—The prohibited anchorage close southwestward of Palembang pilot light-vessel is described on page 107. Submarine cables cross the river near the Resident's house and cross the mouth of Ayer Ogan, just below Kartapati; the latter cable is marked by four warning boards, from each of which a *red* fixed light is exhibited at night. Anchorage is prohibited in the vicinity of these cables and the pipe-line, which crosses the river in the vicinity of Sungei Kundur; *see* pages 18-20.

Harbour facilities.—Provisions and water are plentiful. Coal, fuel oil and Diesel oil are obtainable.

Palembang is connected to the railway system of South Sumatra, and to the general telegraph and district telephone systems. There is regular steamer communication with other ports in the Eastern Archipelago.

Small repairs can be executed. There is a harbour doctor.

Principal tributaries.—Ayer Komering enters the Ayer Musi at Pladju; about 50 miles up it is connected, at high water only, to Sungei Babatan by a canal, suitable for praus, and thence by Sungei Padang to Ayer Mesudji (page 87).

Ayer Ogan enters the Ayer Musi at Kartapati, and, in the west monsoon, is navigable by small craft with a draught of 3 feet ($0^{m}9$) as far as Batu Radja, 120 miles upstream; during the remainder of the year it is only possible at times to reach Tandjung Radja, 30 miles upstream.

Ayer Lematang enters the right bank of Ayer Musi just below Bajur village, situated about 40 miles above Palembang (*Lat. 2° 59′ S., Long. 104° 46′ E.*); in the west monsoon small craft with a draught of 3 feet ($0^{m}9$) can reach Muara Enim, about 90 miles up this tributary.

Charts 3471, 2757, 2149, 941a.

Charts 3476, 3471, 941a.

BANJU ASIN RIVIER.—The Banju Asin rivier, which flows into Straat Banka on the southern side of Tanjong Kampeh, the southern extremity of Batakarang punt, is a broad river, but has only a course of about 35 miles; it should not be entered without local knowledge. At Tanjong Sereh (*Lat. 2° 23′ S., Long. 104° 44′ E.*), situated about 9 miles south-westward of Tanjong Api Api, the southern entrance point of the Banju Asin, which is situated about 4 miles westward of Tanjong Tjarat, the river divides into two branches, the northern being the Ayer Tjalik.

Ayer Lalang enters the northern bank of the Ayer Tjalik about 6 miles westward of Tanjong Sereh and is about 130 miles in length; there are several oil wells near its course from which the oil is carried by pipes to Palembang. Ayer Lalang is navigable by vessels with local knowledge, not exceeding 18 feet ($5^{m}5$) in draught, as far as Muara Bahar, a village situated about 100 miles upstream; *see* Pilotage, page 106.

Buoys.—The greater part of the entrance to the Banju Asin rivier is occupied by shoals, leaving a narrow channel along the south-eastern side past Tanjong Api Api. This channel is marked by three white conical buoys and a black can buoy. The outermost white buoy is moored about 1½ miles northward of Tanjong Api Api and is surmounted by a ball; the next white buoy is moored about 2 miles south-south-westward of the same point; the innermost white buoy is moored about 2¼ miles east-north-eastward of Tanjong Sereh and is also surmounted by a ball. The black can buoy marks a shoal which extends about 1¼ miles north-eastward from Tanjong Sereh.

Chart 2757.

EASTERN COAST OF SUMATRA.—The coast of Sumatra between Batakarang punt and Tanjong Djabung, about 65 miles northward, is low, wooded, and fronted by a mudbank which can be approached until within depths of 5 or 6 fathoms ($9^{m}1$ or $11^{m}0$), except near Tanjong Djabung, which is fairly steep-to and must not be approached within a depth of less than 9 fathoms ($16^{m}5$); it is also possible that this point is extending, *see* also page 231.

Sungei Sembilang (Sungei Batu Buru), an unimportant stream, discharges on the western side of Batakarang punt, about 16 miles westward of Frederik Hendrik klippen (page 103). Telok Benawang (Kendawang baai) and Telok Sekanak (Sekanah baai), lying about 4 and 13 miles, respectively, north-westward of Sungei Sembilang, are shallow and unimportant.

Dangers.—Depths of less than 6 fathoms ($11^{m}0$) extend up to 28 miles offshore about 23 miles northward of Frederik Hendrik klippen, and up to 22 miles offshore about 28 miles south-eastward of Tanjong Djabung. The outer dangers are a 4¾-fathom ($8^{m}7$) patch about 10½ miles northward of Frederik Hendrik klippen; two 6½-fathom ($11^{m}9$) patches about 17 miles west-south-westward and 15½ miles west-north-westward, respectively, of the island of Pulau Penjaman (Joe) (page 115), about 45 miles north-north-eastward of Frederik Hendrik klippen; two 6½-fathom ($11^{m}9$) patches about 27 and 7½ miles eastward, respectively, of Tanjong Djabung; and two 5½-fathom ($10^{m}1$) patches about 13 and 6½ miles, respectively, east-south-eastward of Tanjong Djabung (*Lat. 1° 01′ S., Long. 104° 22′ E.*).

Charts 2149, 941a, 1263.

Chart 2757

The coast northward of Tanjong Djabung is continued in Chapter IX, page 237.

Charts 3471 and 2757.

NORTH-WESTERN AND NORTHERN COASTS OF BANKA.—Bulu baai.—Tanjong Biat is situated about 2½ miles north-eastward of Tanjong Ular (page 103); Bulu baai is entered between the former and Tanjong Genting, about 17 miles north-eastward. Karang Sebidung Uma and the other dangers north-westward of Tanjong Biat have been described on page 103. There is a bright sandy beach in the eastern part of Bulu baai. The shore of the bay is fringed by a coastal bank, which dries, extending as much as one mile in places, and having numerous rocks on it; outside this are many above-water and sunken rocks, and off Tanjong Belanak, situated about 5 miles east-north-eastward of Tanjong Biat, some of these lie nearly 1½ miles offshore. Kamudi, a rock which almost dries at low water, lies about 5 miles south-eastward of Tanjong Genting and nearly 2 miles offshore. The shore bank, with depths of less than 3 fathoms (5^{m}5) over it, extends about 5 miles south-south-westward from Tanjong Genting and a least depth of 2¾ fathoms (5^{m}0), not marked by discoloration, lies on this spit about 4¾ miles southward of the point; there are isolated shoals, with depths of 3 fathoms (5^{m}5) over them, about 1½ and 5½ miles, respectively, southward of the same point.

Charts 2757, 2149.

Tanjong Genting is a rocky point, and there are numerous rocks on the coastal bank which extends a short distance from it. A shoal, with a depth of 5 feet (1^{m}5) over it, lies near the edge of the 6-fathom (11^{m}0) line, about three-quarters of a mile west-north-westward of the point; the northern side of the shoal is comparatively steep-to.

Sungei Kampa and Sungei Bulu flow into the north-eastern part of the bay. Djebus, the centre of a tin mining district, is situated about 3½ miles inland and on Sungei Djebus, a tributary of Sungei Kampa; only flat-bottomed craft can proceed up the latter river, which has a rocky bottom, to the mouth of Sungei Djebus, a distance of 8 miles, and thence to Djebus, a further 3 miles.

Rede Djebus.—Anchorage.—Rede Djebus, in the north-eastern part of Bulu baai, is bounded by the arc of a circle described with a radius of 3 miles from the northern entrance point to Sungei Kampa. There is anchorage, in a depth of 5 fathoms (9^{m}1), soft mud, with Tanjong Genting bearing 018°, distant 1½ miles, and the mouth of Sungei Bulu bearing 098°, care being taken to avoid the 3-fathom (5^{m}5) shoal about 1½ miles southward of the point; small vessels can anchor closer in. The landing place is by the ferry of Kampa village, situated on the northern bank of Sungei Kampa and about 1½ miles from the mouth, but communication with the shore is usually dangerous in the north-west monsoon. Kampa village is connected by telephone with Muntok (*Lat. 2° 04′ S., Long. 105° 10′ E.*).

The Collector of Taxes at Djebus is also the Harbour Master. Praus and lighters are available at the landing place; it is advisable to give notice so that they can be ready. A little fresh water can be obtained at the landing place.

Coast.—Off-lying rocks and reefs.—The coast between Tanjong

Charts 2149, 941a, 1263.

Charts 2757, 2149.

Genting and Tanjong Melala, about 20 miles north-eastward, is fringed by a reef which extends as much as one mile, on which are numerous above-water rocks. The outlying dangers are often unmarked by surf or discoloration, and sounding gives little warning of their existence. Pemudja is an islet lying on the coastal reef close off Tanjong Pemudja, situated about 7 miles north-eastward of Tanjong Genting, and is a useful landmark for avoiding the reefs which lie between Tanjong Pemudja and Tanjong Kelajang (Dojang), nearly 5 miles north-eastward. Prut is a small islet lying about half a mile westward of Tanjong Kelajang. Tanjong Melala is a rocky point, rendered prominent by Melala heuvel, 449 feet ($136^{m}9$) high, situated on the western side of the point.

Within this part of the coast are three prominent hills, which appear as islands from a distance. Mempari (Paree), 768 feet ($234^{m}1$) high, the southernmost of these, is situated about 3¾ miles eastward of Tanjong Genting ; Penjabung, 728 feet ($221^{m}9$) high, is about 2¾ miles north-westward of Mempari and just within Tanjong Penjabung ; Pesukan (Besoekan), 682 feet ($207^{m}9$) high, is situated about 4 miles north-north-eastward of Mempari. Ganten (Gantang), about 6½ miles east-north-eastward of Mempari, is only noticeable from a short distance ; it is 574 feet ($175^{m}0$) high.

A rock awash lies about 2 miles north-eastward of Pemudja and 1½ miles offshore. There are some above-water and sunken rocks about 1½ miles westward of Tanjong Kelajang (*Lat. 1° 34′ S., Long. 105° 27′ E.*). Malang Iju (Hijoe), about 2¾ miles northward of Tanjong Kelajang, consists of two rocks close together, which dry ; two rocks, which dry, lie between Malang Iju and Tanjong Kelajang. Malang Dojang, about 4 miles east-north-eastward of Malang Iju, is a very prominent, greyish-yellow rock in the shape of a vessel floating bottom up ; a coral reef, with a depth of one foot ($0^{m}3$) over it, and unmarked in any way, lies about one mile southward of Malang Dojang, and about one mile farther southward is a 3¼-fathom ($5^{m}9$) patch. There is a rock awash about 1½ miles west-south-westward of Tanjong Sangau, situated about 2 miles westward of Tanjong Melala. Malang Guntur, about one mile northward of Tanjong Sangau, consists of several rocky heads, one of which is above water and the others dry ; a shoal, with a depth of 4¼ fathoms ($7^{m}8$) over it, lies about 1½ miles northward of Tanjong Sangau. A reef, with a depth of 2¾ fathoms ($5^{m}0$) over it, is situated about 2½ miles northward of Tanjong Melala, and is not usually marked by discoloration ; a 5½-fathom ($10^{m}1$) patch lies about half a mile north-north-eastward of this reef. Isolated rocks, with depths of less than 6 feet ($1^{m}8$) over them, lie about one mile north-north-westward, north-eastward and eastward, respectively, of Tanjong Melala ; this point must be given a berth of at least 1½ miles on account of the rocks, not marked by discoloration, which lie off it.

Klabat baai.—Klabat baai, entered between Tanjong Melala (*Lat. 1° 32′ S., Long. 105° 36′ E.*) and Tanjong Penjusu, nearly 6 miles eastward, is divided into an outer and inner bay by Tanjong Ruh, which is situated about 7 miles southward of Tanjong Penjusu and is the extremity of a tongue of land extending from the western side of the bay. The greater part of the outer bay is occupied by a flat, with depths of less than 3 fathoms ($5^{m}5$) over it, and numerous above-water and sunken rocks on it, leaving a narrow channel along the

Charts 941a, 1263.

eastern side of the bay by which vessels of moderate draught, with local knowledge, can reach Rede Blinju, situated near the entrance to the inner bay. The western side of this channel is bounded by a steep-to ridge of sand, which dries in places; the least depth in the fairway of this channel, at its northern entrance, is 3¼ fathoms (5^{m}9). The channel has a granite bottom in places, and thus affords bad anchorage.

The shores of the outer bay consist mainly of sandy beaches with large blocks of granite, and a reef, which dries, extends as much as three-quarters of a mile from the western shore. The head of the inner bay is bordered by mudbanks, with trees on them standing in the water at high tide; several rivers discharge into this bay, Sungei Lajang, which flows into the south-eastern corner, being one of the largest rivers in Banka.

Klabat, a hill about 460 feet (140^{m}2) high, is situated on the western side of the outer bay and about 5 miles southward of Tanjong Melala; it can only be seen from a short distance.

Maras gebergte, 2,291 feet (698^{m}2) high (chart 3471), at the head of the inner bay, rises in the midst of a waste and almost impenetrable district, and is the highest range in Banka; it has three peaks, having the appearance of a crown when seen from Straat Banka, and is very prominent. *See* view facing page 105.

Islets and dangers.—Light.—Buoys.—Tanjong Penjusu, the eastern entrance point of Klabat baai, is a low point from which a spit, with depths of less than 3 fathoms (5^{m}5), extends nearly 2 miles west-north-westward. Pulau Penjusu, a low islet, lies on this spit and about three-quarters of a mile westward of the point, with numerous above-water and sunken rocks between.

A light is exhibited, at an elevation of 115 feet (35^{m}0), from a white iron structure, 66 feet (20^{m}1) in height, situated on the southern side of Pulau Penjusu.

Karang Trasi Laut, about 3 miles north-westward of Pulau Penjusu, is a steep-to rock with a depth of 1½ feet (0^{m}5) over it; it lies with the western part of Maras gebergte (chart 3471) in line with Penjusu light-structure, bearing 156°. Karang Trasi Darat, about 4 cables eastward of Karang Trasi Laut, is a rocky patch with a depth of 5 feet (1^{m}5) over it. Neither of these dangers is marked by discoloration.

Malang Tadjau, a rock which dries, is nearly half a mile westward of Pulau Penjusu, and Anak Tadjau, with a depth of 6½ feet (2^{m}0) over it, lies close north-eastward of Malang Tadjau. A rocky shoal, with a least depth of 1¼ fathoms (2^{m}3) over it and steep-to on its western side, is situated nearly one mile westward of Pulau Penjusu; a black can buoy, surmounted by a truncated cone, is moored off the southern side of this shoal. A shoal, with a depth of less than 6 feet (1^{m}8) over it, is reported to lie close westward of the above-mentioned 1¼-fathom (2^{m}3) rocky shoal.

In the inner bay the islet of Mengkubung, 105 feet (32^{m}0) high, is situated about half a mile west-north-westward of Tanjong Mengkubung, on the eastern shore about 2¾ miles south-south-eastward of Tanjong Ruh (*Lat. 1° 39′ S., Long. 105° 43′ E.*). The Nana eilanden, a group of three islets, lie on a drying bank about 2 miles west-south-westward of Tanjong Mengkubung and the islet of Danto is close to the eastern shore about 3½ miles south-south-eastward of the same point. A shoal, with a depth of 6 feet (1m8) over it, lies in the fairway about half a mile westward of Mengkubung.

There is a buoyed channel along the eastern side of Klabat baai.

Rede Blinju.—Buoys.—Anchorage.—Rede Blinju is bounded westward by the line drawn from Kelapa besar, an islet about one mile north-westward of Tanjong Ruh, through the extremity of this point; northward by a line drawn from Kelapa besar to the small islets which lie off Tanjong Mantong, the eastern entrance point of the inner bay; and southward by the line drawn from Pulau Kambing, situated close off the western shore of the inner bay and nearly 2½ miles south-westward of Tanjong Ruh, to the mouth of Sungei Blinju, which flows out about 2 miles south-eastward of Tanjong Mantong.

Batu Merlang, a rock above water, is on the eastern side of the entrance to the inner bay and about 6 cables east-north-eastward of Tanjong Ruh; a rock, which dries, lies about 2½ cables north-westward of Batu Merlang, and there are several other rocks on the eastern side of this entrance. The channel in Rede Blinju is marked by buoys.

Sheltered anchorage, with sufficient space to swing, can be obtained southward of Tanjong Ruh (*Lat. 1° 39′ S., Long. 105° 43′ E.*) in depths of from 3 to 6 fathoms (5m5 to 11m0). Vessels wishing to unload by praus as close as possible to Blinju can anchor with Batu Merlang bearing 000°, and Tanjong Ruh bearing 300°, in a depth of about 8 fathoms (14m6), mud and sand.

There is an islet about 2 cables southward of Tanjong Mantong, connected to the shore by a dam, and a pier, with a steam crane on it, is built out on the southern side of this dam; there is a slipway for praus near Tanjong Mantong.

Boiler water is available at Mantong; it is supplied in drums brought alongside by praus.

There is a landing place for boats at a wooden pier on the northern bank of Sungei Blinju, about 1½ miles above the mouth; the channel is marked by beacons, privately maintained. Blinju is the capital of a mining district; it is connected to the general telegraph system. There is a small Government hospital here and a harbour doctor. The Collector of Taxes is also the Harbour Master.

A good road leads from the landing place to Blinju. Provisions can be obtained at Blinju and small quantities of water at the landing place.

Praus and lighters are available, but it is advisable to give notice in good time so that they can be ready.

A wooden pier, with a depth of 3 feet (0m9) at the head, extends from Bakit village, situated on the western shore and about 1¼ miles south-westward of Tanjong Ruh. There is regular steamer communication with other ports in the Eastern Archipelago and with Singapore.

Prohibited anchorage.—Two submarine telephone cables cross the entrance to the inner bay between Tanjong Ruh and Tanjong Mantong; anchorage is prohibited in an area bounded northward by a line drawn in an 031° direction from Tanjong Ruh to the northern extreme of Tanjong Mantong, and southward by a line drawn in an 050° direction from Tanjong Ruh to the head of the pier southward of Tanjong Mantong. *See* pages 18-20.

Tidal streams.—The tidal streams in Klabat baai turn at about the times of high and low water. The streams in general follow the direction of the deep channel, but at Tanjong Mantong the flood stream sets into the eastern shore, and the ebb stream into the western shore. Both streams are strong at spring tides, especially in the narrow passage between Tanjong Ruh and Tanjong Mantong, where a maximum rate of 3 knots was observed.

Directions.—To enter the deep channel along the eastern side of Klabat baai, a course of 090° should be steered so as to pass about one cable southward of the black can buoy marking the shoal nearly one mile westward of Pulau Penjusu; then round the white conical buoy moored about 6 cables south-south-westward of Pulau Penjusu (*Lat. 1° 32′ S., Long. 105° 41′ E.*) and steer a south-south-easterly course through the channel by sight of the buoys.

There is a navigable channel, with a least depth of 2¼ fathoms (4^{m}1), from Rede Blinju to the mouth of Sungei Lajang, where there is a bar with a least depth of 6 feet (1^{m}8). This channel leads between the islet of Mengkubung and the Nana eilanden, and thence close south-westward of the islet of Danto; *see* page 114 for the shoal in the fairway westward of Mengkubung. Within the bar the depths in the river increase, and there is an electric power station about 2 miles within the mouth.

Coast.—Dangers.—The coast between Tanjong Penjusu and Tanjong Mengkudu, a rocky point nearly 11 miles eastward, is fronted by a sandy beach. Several rocks lie close off the western part of this coast, and it should not be approached into depths of less than 6 fathoms (11^{m}0). The Mengkudu eilandjes lie about half a mile northward of Tanjong Mengkudu. There are two villages along this coast, both visible from seaward: Bubus, near the mouth of Sungei Bubus, which flows out about 4½ miles eastward of Tanjong Penjusu, and Salin, about half a mile eastward of the mouth of Sungei Sembuang, which flows out about 3½ miles farther eastward.

A dangerous shoal, with a depth of 3 fathoms (5^{m}5) over it, lies about 4¼ miles westward of Tanjong Mengkudu and about 2½ miles offshore.

Tanjong Grasak (*Lat. 1° 30′ S., Long. 105° 55′ E.*), about 2 miles eastward of Tanjong Mengkudu, is the northern extremity of Banka and is a rocky point.

The southern and eastern coasts of Banka are described in Chapter VI.

ISLANDS NORTHWARD OF BANKA.—Tudju eilanden.— The Tudju eilanden lie northward of Banka, with Pulau Penjaman (Joe), 289 feet (88^{m}1) high, the southernmost island of the group, about 26 miles northward of Tanjong Genting; they are generally visible at a distance of about 25 miles. They are visited occasionally by coasters and native praus. There are native settlements on Tjebia and Pasir Keliling (Lalang); the latter is covered with coconut trees.

All the islands are surrounded by reefs. The southernmost dangers are two shoals, with depths of 6½ and 5½ fathoms (11^{m}9 and 10^{m}1) over them, about 3¼ miles south-south-eastward and three-quarters of a mile south-westward, respectively, of Pulau Penjaman. A rock, with a depth of less than 6 feet (1^{m}8) over it, and a shoal, with a depth of 5½ fathoms (10^{m}1) over it, lie, respectively, nearly one mile and about 2¾ miles east-north-eastward of the eastern extremity of Pasir

Charts 2757, 2149.

Keliling, which is situated about three-quarters of a mile north-westward of Pulau Penjaman.

Tjebia, about 3 miles northward of Pulau Penjaman, has two peaks, the north-western, 361 feet ($110^{m}0$) high, being slightly the higher; the reef which surrounds it extends about one mile eastward from its southern extremity. There are three rocks, with depths of less than 6 feet ($1^{m}8$) over them, about three-quarters of a mile eastward, one mile north-north-eastward, and one mile west-north-westward of its north-western extremity; between the last-mentioned rock and the north-western extremity of the island is a 2½-fathom ($4^{m}6$) patch. A 5½-fathom ($10^{m}1$) patch lies about 2 miles eastward of the same point.

Lalang (Meranti), 112 feet ($34^{m}1$) high, lies about 1½ miles south-westward of the southern extremity of Tjebia, and Ju (Satoe), 105 feet ($32^{m}0$) high, is about 1½ miles north-westward of Lalang. A shoal, with a least depth of 2¼ fathoms ($4^{m}1$) over it, lies about half a mile south-westward of Lalang, and there is another shoal, with a similar depth over it, about 3 cables south-eastward of Ju.

Pulau Pekatjang (Katjangang), the largest and easternmost island of the group, has several peaks, one of which rises to a height of 538 feet ($164^{m}0$); the reef which surrounds it extends nearly half a mile from its south-eastern extremity, and there are several rocks above water on it. A rock, with a depth of less than 6 feet ($1^{m}8$) over it, is situated about 1¼ miles westward of the southern extremity of Pulau Pekatjang and depths of less than 5 fathoms ($9^{m}1$) extend about one mile south-westward from this rock.

Chart 1789.

Tokong Kembang, 120 feet ($36^{m}6$) high, lies about 2½ miles north-westward of the north-western extremity of Pulau Pekatjang. There is an above-water rock, surrounded by a reef, about three-quarters of a mile west-north-westward of Tokong Kembang, and a 1¼-fathom ($2^{m}3$) patch lies between the rock and Tokong Kembang (*Lat. 1° 08′ S., Long. 105° 14′ E.*).

Charts 1789, 2757, 2149.

Passage between the islands for vessels of shallow draught is, for the most part, safe, but caution is necessary as the shoals are not generally marked by discoloration.

Anchorage can be found everywhere, but the holding ground is not good.

Charts 2757, 2149.

Tidal streams.—In a position about 13 miles south-south-westward of the Tudju eilanden, where observations were made, the tidal streams run north-eastward and south-westward and are mainly diurnal.

The tidal streams in this position, Straat Banka, Northern Approaches (*Lat. 1° 24′ S., Long. 105° 10′ E.*), are predicted in Admiralty Tide and Tidal Stream Tables. The predictions give the times of maximum rate in either direction, times of turn and maximum rates in either direction.

The maximum rate of the stream running north-eastward can be expected to average one knot in June and July, and in December and January (with diurnal spring tides); the maximum rate of the stream running south-westward can be expected to average 1¼ knots from November to January, and from May to July (with diurnal spring

Charts 2149, 941a, 1263.

Charts 2757, 2149.

tides). In addition to the streams setting north-eastward and south-westward, a stream setting across these directions, with a maximum rate of 1¼ knots, was observed.

Tide rips and strong whirlpools have often been observed south-westward of Tjebia.

Chart 1789.

Dokan and adjacent dangers.—Dokan, about 26 miles east-north-eastward of Tokong Kembang, is 387 feet (118^{m}0) high and can be plainly identified from a distance of 24 miles in clear weather; its summit appears sharp when seen from northward, but is rounded from eastward. It is surrounded by a reef, which extends about one mile from its northern side, with some above-water and sunken rocks on it. Two islets, the northern being 99 feet (30^{m}2) high, lie close northward of Dokan.

Three reefs lie southward of Dokan. Mary rock, the southernmost of these, is about 1½ miles southward of the island; they all have depths of less than 6 feet (1^{m}8) over them.

Toty.—Toty (*Lat. 0° 55′ S., Long. 105° 46′ E.*), about 7½ miles east-north-eastward of Dokan, is 367 feet (111^{m}9) high; its summit appears rounded from northward and sharp from eastward. The island is surrounded by a reef, which extends about half a mile north-westward and a quarter of a mile south-eastward.

The channel between Toty and Dokan is clear; the reefs around these islands are not marked by discoloration.

Charts 2149, 941a, 1263.

CHAPTER VI

GASPAR STRATEN AND THEIR APPROACHES—NORTH-EASTERN SIDE OF BANKA

Chart 2137.

GASPAR STRATEN.—General description.—Gaspar straten, between the large islands of Banka and Billiton, is stated to derive its name from the Spanish captain who passed through it in 1724, though Captain Hurle had previously done so when returning from China in the galley *Macclesfield* in March, 1702.

Several islands divide the strait into three principal passages, named successively, from west to east, Macclesfield straat, Clement straat, and Stolze straat. The first, through which the *Macclesfield* passed, lies between Pulau Lepar and Pulau Liat. The second is named after Captain Clements, who passed through it in 1781. Stolze straat leads westward of the Lima eilanden and Pulau Mendanau (*Lat. 2° 53′ S., Long. 107° 26′ E.*).

Gaspar straten are frequently used by vessels proceeding from Sunda strait to Singapore, or from the western part of Java to the China sea, and vice versa, although the route through Straat Banka is safer and better lighted.

Stolze straat, being the broadest and having no dangers in the fairway, is the best channel but vessels of low power should use Macclesfield straat during the north-west monsoon, and Stolze straat during the south-east monsoon, the currents thus being less unfavourable. Clement straat is seldom used.

The reefs which dry are nearly always discernible, when covered, by the brown or green colour of the water over them. The other reefs are, however, usually difficult to discern, as the water in the strait is somewhat muddy, and they are only recognisable when stream and wind cause tide rips and surf. Large brown patches of fish-spawn, often seen in and near the strait, may be mistaken for the discoloration of reefs.

Currents and tidal streams.—The horizontal movement of the water in Gaspar straten consists mainly of the monsoon current; the connection between the horizontal and vertical movements of the water has not yet been established.

The tidal streams are strong in Macclesfield and Clement straten but their directions are somewhat difficult to foretell. The same applies to Stolze straat, except for the following particulars obtained near Langkuas (*Lat. 2° 32′ S., Long. 107° 38′ E.*), an islet off the

Charts 2149, 941a, 1263.

north-western coast of Billiton: The directions of the tidal streams perform a complete circle, clockwise, in 24 hours. The maximum rate always occurs twice each day, when the stream is running either in a north-north-easterly or a south-south-westerly direction; the streams which run in an east-south-easterly or a west-north-westerly direction are about half this rate.

Pilots.—Good native pilots can be obtained at Tandjung Pandan, the capital of Billiton, and they are perfectly capable of taking power vessels through the narrowest passages. Vessels without local knowledge visiting any of the islands in the strait are always advised to employ the services of a pilot.

Islets and dangers in the southern approach to Gaspar straten.—Light.—Beacon.—Numerous dangers, with depths of from 7 to 10 fathoms (12m8 to 18m3) between them, lie in the southern approach to Gaspar straten.

Hippogriffe riffen, the south-western of these dangers, lie about 37 miles south-eastward of Tanjong Langgan, the southern extremity of Banka, and about 23 miles south-westward of Ondiepwater (Shoalwater) eiland; they consist of four coral patches, with depths of from 2 to 23 feet (0m6 to 7m0) over them, and are sometimes marked by tide rips, whilst birds are frequently seen in their vicinity. These reefs lie outside the visibility of the light on Ondiepwater eiland at night, and this island cannot be seen from them by day; sounding gives little indication of the vessel's position, as the depths hereabouts are fairly regular, being between 7 and 10 fathoms (12m8 and 18m3), and the reefs are steep-to. A patch, with a depth of 6½ fathoms (11m9) over it, lies about 2½ miles south-south-eastward of the reefs.

Fairlie rock, about 14½ miles west-south-westward of Ondiepwater eiland, has a depth of 3 feet (0m9) over it, and is sometimes marked by discoloration. There is a 6-fathom (11m0) patch about 1½ miles north-westward of Fairlie rock, and a 6½-fathom (11m9) patch about 2½ miles north-north-eastward of the same rock. Ondiepwater eiland is visible from Fairlie rock, and in clear weather three peaks of the hills on the southern side of Pulau Lepar can be seen, the middle one being Mudjuk (page 122).

Blas Mateu, about 17 miles westward of Ondiepwater eiland and 6½ miles north-westward of Fairlie rock, is of coral and has a least depth of 1½ fathoms (2m7) over it; it is seldom marked by discoloration. From this reef Ondiepwater eiland is only just visible from aloft; the hills on the southern side of Pulau Lepar, and the hills near Tanjong Baginda, the south-eastern extremity of Banka, are visible. About 3¾ miles west-south-westward of Blas Mateu is a 6½-fathom (11m9) patch.

Hancock shoal, nearly 17 miles south-south-westward of Ondiepwater eiland, is a small coral reef with a depth of 3 fathoms (5m5) over it. Schildpad (Turtle shoal), about 2 miles east-north-eastward of Hancock shoal, is a small coral reef with a rock awash on it. Larabe shoal, about 3½ miles eastward of Schildpad, is a small coral reef with a depth of 2¾ fathoms (5m0) over it. These three dangers are surrounded by dephts of 7 fathoms (12m8) and more, and are not marked by discoloration.

Zand rif (Sand bank) (*Lat. 3° 29′ S., Long. 107° 10′ E.*), about 10 miles south-south-westward of Ondiepwater eiland, is a small sand

Chart 2137.

bank which dries. There are several reefs around Zand rif, of which Haaien (Haaijen) rif, with a depth of 2½ fathoms ($4^{m}6$), about 3½ miles westward of Zand rif, is the westernmost. Padang rif, nearly 2 miles west-north-westward of Zand rif has a least depth of 6 feet ($1^{m}8$) over it. Middel (Middle) rif lies about 2¼ miles north-north-eastward of Zand rif, is very similar to it, and also dries. Branding riffen, nearly 3 miles northward of Zand rif, are two small reefs awash. A 6-fathom ($11^{m}0$) patch lies about 2 miles north-north-westward of Branding riffen.

Ondiepwater (Shoalwater) eiland, known locally as Si Medang, is covered with high trees and can be seen from a distance of about 15 miles in clear weather; a pier extends from the south-eastern side of the island, and a beacon, with conical topmark, stands about 3 cables eastward of the head of this pier. Kleine Ondiepwater (Hancock) eiland lies about three-quarters of a mile north-eastward of it, and is covered with coconut trees. There is a 1¾-fathom ($3^{m}2$) patch about three-quarters of a mile north-westward of Kleine Ondiepwater eiland. Both islands are surrounded by reefs.

A light is exhibited, at an elevation of 196 feet ($59^{m}7$), from a white iron tower, 187 feet ($57^{m}0$) in height, situated in the centre of Ondiepwater eiland.

Ondiepwater eiland must be given a berth of 3 miles on the western and northern sides, and fully one mile on the eastern side, as there are numerous reefs in the vicinity. Patches with depths of one and 1½ fathoms ($1^{m}8$ and $2^{m}7$) over them lie, respectively, about three-quarters of a mile and 1¾ miles westward of the island, and there is a 6-fathom ($11^{m}0$) patch about 2½ miles westward of the same island. Embleton riffen, about 2 miles north-westward of the island, consist of two reefs, on the southern of which is a rock which dries, visible about 3 miles at low water. Bliss rif lie about 2¼ miles northward of the island, and have a least depth of one foot ($0^{m}3$), coral, over them. A patch, with a least depth of 3¾ fathoms ($6^{m}9$) over it, lies about three-quarters of a mile east-south-eastward of Bliss rif.

WESTERN SIDE OF GASPAR STRATEN.—Southern coast of Banka.—The southern coast of Banka, between Tanjong Langgan (*Lat. 3° 07′ S., Long. 106° 31′ E.*) (page 93) and Tanjong Baginda, nearly 14 miles eastward, consists mainly of rocky points with low coastal land, covered with high trees, between them. Tanjong Bantil and Tanjong Dua, about 2½ and 8¾ miles eastward, respectively, of Tanjong Langgan, are both fairly high. Tanjong Baginda is a steep point, 392 feet ($119^{m}5$) high, and Baginda, a hill 550 feet ($167^{m}6$) high, is situated about 2 miles west-north-westward of it.

The whole of this coast is fronted by a mudbank, with depths of less than 3 fathoms ($5^{m}5$), on which are numerous above-water and sunken rocks; Malang Belajar, about 1½ miles south-westward of Tanjong Dua, are two prominent rocks above water. The depths outside this mudbank are very irregular, and shoals with depths of from 3 to 5 fathoms ($5^{m}5$ to $9^{m}1$), the positions of which are best seen on the chart, lie up to nearly 5 miles offshore. There is a 6-fathom ($11^{m}0$) patch about 8 miles southward of Tanjong Dua. Coasting vessels, with local knowledge, coming from Straat Banka and making for Gaspar straten, usually keep in depths of over 11 fathoms ($20^{m}1$) in this vicinity.

Charts 2149, 941a, 1263.

Chart 2137.

Eastern coast of Banka.—Shoals.—Light.—Tanjong Ru is situated nearly 5 miles northward of Tanjong Baginda. Between the former and Tanjong Berikat, about 27 miles north-north-eastward, is a wide bight, frequented by small coasters and praus, in which the depths are mostly less than 3 fathoms ($5^{m}5$), soft mud. Pulau Lepar, which forms the southern side of this bight, is separated from the south-eastern extremity of Banka by Straat Lepar, which is only navigable by small craft. Tinggi, the south-easternmost of the islands lying in the northern entrance to this strait, has a conical hill on it, 606 feet ($184^{m}7$) high, which is very prominent when seen from south-south-eastward. Burong, Ibul, Seniur (Senior), and Kelapan (Kilapan) are hilly islands lying off the northern coast of Pulau Lepar.

Kampong Kumbing is situated on the northern coast of Pulau Lepar, about one mile south-westward of Tanjong Sangkar (Langkar), its northern extremity; vessels wishing to visit this village will find good anchorage, especially in the west monsoon, southward of Seniur.

The shore of the bight is low, and consists of sandy beaches or is overgrown with mangroves. Numerous shoals were reported, in 1937, within depths of 5½ fathoms ($10^{m}1$) between Kelapan island and Tanjong Berikat.

Tanjong Berikat, the eastern extremity of Banka, is rendered prominent by Berikat, a hill 391 feet ($119^{m}2$) high, with a prominent tree on its south-eastern slope; some above-water rocks lie close off the point. Telok Batu is situated about 4½ miles westward of Tanjong Berikat and about 5½ miles further westward is Sapat (Sepat), 653 feet ($199^{m}0$) high; these two hills are a continuation eastward of the Pading gebergte (page 140).

A light is exhibited, at an elevation of 106 feet ($32^{m}3$), from a white iron structure, 46 feet ($14^{m}0$) in height, situated on Tanjong Berikat (*Lat. 2° 34′ S., Long. 106° 51′ E.*).

MACCLESFIELD STRAAT.—Macclesfield straat is bounded westward by Pulau Lepar, with several shoals lying southward of it, and the eastern coast of Banka; eastward by Pulau Liat and a number of islets and shoals southward of it. It is well lighted, and there are many prominent landmarks for determining a vessel's position, except in the southern approach, where some of the dangers lie out of sight of land. The narrowest part of the channel, between Pulau Lepar and Pulau Liat, is restricted to a width of about 3 miles by shoals lying off the coasts of these two islands. *See* view C on chart 2137.

Southern part of Macclesfield straat.—Dangers.—Hippogriffe riffen, Fairlie rock, and Blas Mateu, on the eastern side of the southern approach to Macclesfield straat, have been described on page 119.

Drievadems bank, with a least depth of 2 fathoms ($3^{m}7$) over it, lies on the western side of the channel, about 6½ miles southward of Tanjong Murung, the south-eastern extremity of Pulau Lepar; irregular depths of from 6½ to 4¼ fathoms ($11^{m}9$ to $7^{m}8$) extend for about 9 miles west-south-westward from this bank. This bank is especially dangerous at night, although it lies just within the arc of visibility of the light on Tanjong Labu, the eastern extremity of Pulau Lepar. Two 4¼-fathom ($7^{m}8$) patches and a 4¾-fathom ($8^{m}7$) patch lie, respectively,

Charts 2149, 941a, 1263.

Chart 2137.

about 2¾ miles westward, 1¾ miles north-north-westward and 2¼ miles north-north-eastward of Drievadems bank.

A 4¾-fathom ($8^{m}7$) patch lies nearly 13 miles southward of Tanjong Murung, and about 3 miles westward of this patch is a 3¼-fathom ($5^{m}9$) patch. About 8 miles west-south-westward of the 3¼-fathom ($5^{m}9$) patch is a 4¼-fathom ($7^{m}8$) patch, and two 6½-fathom ($11^{m}9$) patches lie about 2 miles southward and 5 miles west-south-westward of the 4¼-fathom ($7^{m}8$) patch.

George banks, with depths of less than 6 fathoms ($11^{m}0$) over them, extend nearly 9 miles south-westward from a position about 2¼ miles south-westward of Tanjong Murung; the least depth over them, in the north-eastern part, is 1½ fathoms ($2^{m}7$). There are irregular depths of from 4¼ to 17 fathoms ($7^{m}8$ to $31^{m}1$) between George banks and Drievadems bank.

Sittart riffen (Vansittart shoals) lie on the eastern side of the channel and about midway between Ondiepwater eiland and Pulau Liat; they cover an area of about 6½ miles in a north and south direction, and some of them dry or are awash. The westernmost reef, with a depth of 3 feet ($0^{m}9$) over it, is about 11½ miles south-eastward of Tanjong Murung.

Bakau (*Lat. 3° 02′ S., Long. 107° 09′ E.*), the southernmost of the above islets, lies about 8¼ miles south-south-eastward of the southern extremity of Pulau Liat, and is low and covered with vegetation; it is surrounded by a coral reef, steep-to on its western side, but there are several detached reefs which extend as much as three-quarters of a mile from the southern and eastern sides. Kalangbahu (Kalangbue), nearly one mile north-eastward of Bakau, is saddle-shaped when seen from the northward or southward, the eastern peak, 256 feet ($78^{m}0$) high, being the higher of the two. Selemar (Slemar), about 3½ miles north-westward, and Kuëel (Kwil), about 3 miles north-north-westward, respectively, of Bakau, are low, but are covered with high trees; both islets are surrounded by reefs, and foul ground extends about 1½ miles southward from Kuëel, but it is always marked by discoloration and portions of it dry. Middel passage, which leads from Macclesfield straat to Clement straat, is described with the latter channel on page 125.

Narrows of Macclesfield straat.—Dangers.—Lights.—The greater part of Pulau Lepar, which forms the western side of the narrows, is low and wooded, but a ridge of hills runs along the south-western side of the island from Tanjong Murung. Mudjuk (Maroon), situated about 4¾ miles west-north-westward of this point, is 617 feet ($188^{m}1$) high, and the most prominent peak. Tanjong Murung is a rocky point, 200 feet ($61^{m}0$) high. The eastern coast of the island must be given a wide berth, as a bank, with depths of less than 3 fathoms ($5^{m}5$), with some rocks which dry on it, extends as much as 1½ miles.

Tanjong Labu, the eastern extremity of Pulau Lepar, is low and is fringed by a coastal reef on which are numerous rocks above water. Bakung (Rocky point hill), a hill 348 feet ($106^{m}1$) high, is situated nearly 2 miles westward of the point, and Labu, the principal village on the island, is situated about one mile north-westward of the point. Klippige shoals, rocks which dry, lie within a distance of 2 miles north-eastward and eastward of Tanjong Labu, and some of them are very prominent when they are above water; only one rock, lying

Charts 2149, 941a, 1263.

Chart 2137.

about 1¼ miles east-south-eastward of the point, however, shows at high water, and at spring tides this is also covered. There are depths of about 4½ fathoms ($8^{m}2$) for about one mile south-south-eastward of these rocks. About 2¾ miles eastward of Tanjong Labu is a 4¾-fathom ($8^{m}7$) patch. Batu Denem, which dries, lies about one mile northward of this point and half a mile offshore. A 2-foot ($0^{m}6$) patch lies about 3 miles northward of Tanjong Labu, and about one mile westward of this patch is a 4¾-fathom ($8^{m}7$) shoal.

A light is exhibited, at an elevation of 69 feet ($21^{m}0$), from a white iron framework structure, 72 feet ($21^{m}9$) in height, situated on Tanjong Labu (*Lat. 2° 57′ S., Long. 106° 55′ E.*).

Pulau Liat, on the eastern side of the narrows, is low, flat, and wooded, except for a ridge of hills in the southern part, none of which is prominent; Keladi (Putat), 446 feet ($135^{m}9$) high, is one of the highest. The island is surrounded by a reef, and there are numerous detached, steep-to reefs outside, many of which dry, and some of them lie as much as 2 miles offshore. A spit, which partly dries, extends about 2¾ miles southward from Batu Tambun, the south-eastern extremity of the island. Tjelaka (Chelaka), a rocky islet covered with vegetation, lies on the coastal reef which extends from the western extremity of the island; there are several reefs westward and north-westward of this islet, and it should be given a berth of 2 miles.

Rede Tjelaka lies between Tjelaka and Pulau Liat. A narrow passage, available for boats, leads through the reefs southward of Tjelaka to a pier on that island and to a pier at the village of Pongok, on the western extremity of Pulau Liat.

A light is exhibited, at an elevation of 49 feet ($14^{m}9$), from a white iron framework structure, 46 feet ($14^{m}0$) in height, situated on the north-western side of Tjelaka (*Lat. 2° 52′ S., Long. 107° 01′ E.*).

Discovery rocks, which dry and are steep-to, lie in the middle of the narrows and about 4 miles west-south-westward of Tjelaka; the usual route is eastward of these rocks. Alceste rif, a group of rocks, some of which dry, lies about one mile westward of the northern extremity of Pulau Liat and extends to a position about 1½ miles north-north-westward of the same point; there are several reefs southward and eastward of it.

Northern part of Macclesfield straat.—Dangers.—A 5½-fathom ($10^{m}1$) coral patch, which is the easternmost danger in the northern part of Macclesfield straat, lies about 10 miles south-south-eastward of Tanjong Berikat (page 121). Wilson bank, about 6½ miles south-south-eastward of Tanjong Berikat, has a least depth of 1½ fathoms ($2^{m}7$) over it. Nutshorn bank, westward of Wilson bank, is a projecting spit of the coastal bank, and has a depth of 1½ fathoms ($2^{m}7$) on its outer end. A rock, with less than 6 feet ($1^{m}8$) over it, is situated on this bank about 6 miles southward of Tanjong Berikat; there is a depth of three-quarters of a fathom ($1^{m}4$) on the coastal spit about 3½ miles south-south-eastward of the same point.

Tanjong Berikat should be given a wide berth; the coastal bank extends about 4 miles south-south-eastward from the point, and there is often a strong current here.

Boompjes eiland, about 9½ miles north-eastward of Tanjong Berikat, and the other islets and dangers in this vicinity are described on page 138.

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Chart 2137.

Directions.—*From southward.*—Vessels should make for a position about 4 miles westward of Hippogriffe riffen and then steer to make good 005°, passing westward of Fairlie rock and Blas Mateu, when land will soon be sighted; Ondiepwater eiland should on no account be sighted by day. When past Blas Mateu vessels should steer to pass midway between Drievadems bank, lying about 6½ miles southward of Tanjong Murung, and Sittart riffen, taking care to avoid the 4¾-fathom (8^{m}7) patch about 13 miles southward of Tanjong Murung, and thence northward between Discovery rocks and Tjelaka, giving the latter a berth of about 2 miles; care must be taken to avoid the 4¾-fathom (8^{m}7) patch lying about 2¾ miles eastward of Tanjong Labu. When the northern extremity of Pulau Liat bears 090° vessels should steer to pass eastward of Gaspar island (page 138), or eastward of Tanjong Berikat, according to destination, taking care to avoid the 5½-fathom (10^{m}1) coral patch, situated about 10 miles south-south-eastward of Tanjong Berikat (*Lat. 2° 34′ S., Long. 106° 51′ E.*).

In thick weather it is advisable to anchor on the bank, in depths of from 7 to 10 fathoms (12^{m}8 to 18^{m}3), around Hippogriffe riffen, and await more favourable conditions. Vessels coming from the Java sea, and uncertain of their position, can approach the coast of Sumatra to a depth of 9 fathoms (16^{m}5).

Drievadems bank, with a depth of 2 fathoms (3^{m}7), lying about 6½ miles southward of Tanjong Murung, can be approached fairly closely by sounding; northward of this bank the bottom is usually sand in depths of from 7 to 9 fathoms (12^{m}8 to 16^{m}5), and clay and mud in greater depths.

From northward.—Gaspar island and the adjacent dangers off the northern entrance to Gaspar straten are described on page 138; the north-eastern coast of Banka, with the off-lying dangers, is described on pages 139-150. Clear weather and good visibility are essential for this route, otherwise it is advisable to proceed through Straat Banka. Once Tanjong Berikat is sighted, however, the entrance to Macclesfield straat presents no difficulty, and the directions given for vessels proceeding through from southward can be followed in the reverse order.

At night.—Vessels proceeding through Macclesfield straat at night should take care that they sight Tanjong Murung during daylight if approaching from southward, and, if approaching from northward, Tanjong Berikat should be sighted during daylight.

CLEMENT STRAAT.—Dangers.—Clement straat is bounded westward by Sittart riffen, Kalangbahu and Kuëel, and eastward by Aur (Auer) and Kelemar (Klemar); the channel then passes eastward of Pulau Liat.

Sittart riffen have been described on page 122; the south-eastern of these reefs, which is a drying patch, is situated about 9 miles south-south-westward of Kalangbahu, and the eastern reef, with a depth of 1¼ fathoms (2^{m}3) over it, lies about 5 miles southward of Kalangbahu. About 3 miles south-south-westward of Kalangbahu there is a reef with a depth of 2¾ fathoms (5^{m}0), and a depth of 4¼ fathoms (7^{m}8) lies about half a mile south-eastward of the same island.

Kalangbahu and Kuëel have been described on page 122. De Brauw rif, a small portion of which dries, lies about three-quarters of a mile north-eastward of Kalangbahu and is separated from it by

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Chart 2137.

a narrow passage with depths of about 14 fathoms ($25^{m}6$). Aur and Kelemar (*Lat. 2° 58′ S., Long. 107° 14′ E.*) are hilly islands covered with heavy timber; Aur has a peculiar sharp summit, 172 feet ($52^{m}4$) high, and Kelemar is 212 feet ($64^{m}6$) high. Both islands are surrounded by reefs, and foul ground extends nearly one mile southward from Aur; there are two reefs, with depths of less than 6 feet ($1^{m}8$) over them, and two 1¼-fathom ($2^{m}3$) patches in the channel between these two islands. A 4¾-fathom ($8^{m}7$) patch lies nearly midway between the islands.

Gevaarlijke klip, with a depth of 4 feet ($1^{m}2$), coral, over it, lies in the fairway of Clement straat and about 2 miles westward of Kelemar; the southern extremity of Geresik (page 128) in line with the northern extremity of Aur, bearing about 113°, leads about 3 cables north-eastward of this danger.

Tominkor (Middle Pass shoals), about 3 miles northward of Kuëel, partly dries and is marked by discoloration; a ridge of sand and clay, with depths of from 6 to 7 fathoms ($11^{m}0$ to $12^{m}8$) over it, extends about one mile southward from this reef.

Koraal rif (Coral bank), awash, lies about 1½ miles north-eastward of the southern extremity of Pulau Liat.

Generaal Hewitt reef (Hewitt shoal), about 4¾ miles north-north-westward of Kelemar, is a steep-to coral reef with a least depth of 2 fathoms ($3^{m}7$), and is not marked by discoloration. The summit of Aur in line with the north-eastern point of Kelemar, bearing about 178°, leads about 1½ miles eastward of Generaal Hewitt reef.

Sandringham shoal, consisting of two patches, with depths of 3 and 6 feet ($0^{m}9$ and $1^{m}8$) over them, lies about 2 miles north-eastward of the northern extremity of Pulau Liat.

Akbar droogte, about 19 miles northward of Kelemar, is a small, steep-to shoal of stone and coral, with a depth of 3 feet ($0^{m}9$) over it; it is very dangerous, as it is not marked by discoloration and sounding gives no warning.

Middel passage.—Middel passage, between Selemar and Kuëel on the southern side, and the dangers which extend southward from Pulau Liat on the northern, unites Macclesfield and Clement straten and is deep in the fairway. From the westward, to pass southward of the dangers extending southward from Pulau Liat, Kelemar must not bear more than 090° until Selemar bears more than 136°. The northern extremities of Selemar and Kuëel should be given a berth of at least three-quarters of a mile, and care should be taken to avoid the 6-fathom ($11^{m}0$) patch about one mile southward of Tominkor.

There is also a passage between Selemar and Kuëel on the northern side, and Bakau and Kalangbahu on the southern side, taking care to pass well clear southward of the dangers which extend about 1½ miles southward from Kuëel. A vessel wishing to pass through this passage from westward should keep the southern extremity of Kalangbahu in line with the northern extremity of Bakau, bearing about 091°, until Selemar bears 000°, when the passage will be open.

Directions.—Vessels making for Clement straat from southward should follow the directions given for Stolze straat on page 131 as far as Ondiepwater eiland (*Lat. 3° 19′ S., Long. 107° 13′ E.*), when they should steer for the entrance of the channel with this island bearing 180° astern. When Kalangbahu bears 270°, course can be altered to

Charts 2149, 941a, 1263.

Chart 2137.

make good 350° so as to pass between Gevaarlijke klip and Kelemar, and thence between Tominkor and Generaal Hewitt reef.

Clement straat should not be attempted at night, as Gevaarlijke klip is outside the arc of visibility of the light on Ondiepwater eiland, and the only light visible here is that on Tanjong Ajer Lantjur (Ayer Lanchur), the western extremity of Pulau Mendanau.

STOLZE STRAAT.—Stolze straat is the easternmost and broadest of the three passages through Gaspar straten, and is preferable to the other two. The narrowest part of the strait, between Geresik and the Lima eilanden, is fully 4 miles wide; at night the lights on both Ondiepwater eiland and Tanjong Ajer Lantjur are visible when navigating this part. Kebatu (page 153), an islet about 30 miles southward of Billiton, is a useful landmark for vessels bound for Stolze straat from south-eastward. *See* views A and B on chart 2137.

Southern part of Stolze straat.—Beacon.—Larabe shoal, Middel rif, and Ondiepwater eiland, with its light, which all lie on the western side of the southern part of Stolze straat, have been described on pages 119-120.

A 28-foot (8^{m}5) patch (chart 2149) lies in the fairway of the southern approach of Stolze straat, about 28¾ miles southward of Tanjong Genting (Kiras), *see* page 133, and about 12 miles south-westward of Carnbee rocks, described below, and is the southernmost danger on the eastern side.

Carnbee rocks are situated about 20 miles southward of Tanjong Genting, the south-western extremity of Billiton. They consist of three small coral patches; the western patch has a depth of less than 6 feet (1^{m}8) over it; the northern, which lies fully one mile northward of the other two, has a depth of 1¾ fathoms (3^{m}2) over it, whilst the third patch has a depth of 1¼ fathoms (2^{m}3) over it. The depths around these reefs, which are steep-to, are irregular. At high water and with a calm sea it is difficult to locate them at a distance of more than one cable; in clear weather, however, the mountains of Billiton can be seen from southward of these reefs, and Bagienda (Bagenda), a hill near Tanjong Genting, then appears as two hummocks. *See* views facing page 130.

Naga reef, about 12½ miles southward of Tanjong Genting (*Lat. 3° 15′ S., Long. 107° 37′ E.*), is composed of coral and large rocks, and has a least depth of 3 feet (0^{m}9) over it; it is frequently marked by tide rips, but seldom by discoloration.

Aanvang (Anvang) bank, about 2½ miles northward of Naga reef, consists of two patches which dry; the eastern is composed of sand, and the western of large black rocks, some of which are visible at high water, and at low water may be seen from a distance of 4 miles.

Cooper reef, about 2½ miles north-north-westward of Aanvang bank, has a depth of 3 feet (0^{m}9) over it. A reef, with a depth of 2 feet (0^{m}6) over it, lies about 5 miles north-westward of Cooper reef, and midway between is a shoal with a least depth of 3¾ fathoms (6^{m}9); a 4¾-fathom (8^{m}7) patch lies about 1½ miles north-north-westward of the latter. Cooper reef and the 2-foot (0^{m}6) shoal are unmarked in any way.

Masar eilanden, about 8 miles south-eastward of Tanjong Genting, are described on page 152.

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Chart 2137.

Seliu (Selio) lies with its southern extremity about 5 miles west ward of Tanjong Genting, and is low except for Marang (Gunong) Bolo, a hillock 224 feet (68^{m}3) high, on its southern point. The trees are lower between this hillock and the northern part of the island, so that at a distance of from 12 to 16 miles it has the appearance of two islands. The island is surrounded by a reef which mostly dries, and on which are several rocks above water. Saribu lies nearly 1½ miles south-eastward of Seliu, on a shoal flat which extends about 4 miles south-eastward from that island; the channel between this flat and the south-western extremity of Billiton is only navigable for praus. Batu Saribu is a white rock about 6 cables south-south-eastward of Saribu.

Batu Malang (White rock), about 3 miles westward of Marang Bolo, is 28 feet (8^{m}5) high and is situated on the western extremity of a large reef, which dries; there are also two above-water rocks on the northern and southern extremities of this reef, respectively. A bank of hard sand, with depths of from 3 to 5½ fathoms (5^{m}5 to 10^{m}1) over it, extends about 2 miles south-eastward from this reef; the eastern peak of Bagienda in line with Batu Saribu, bearing 055°, leads between the southern end of this bank and the 2-foot (0^{m}6) patch about 5 miles north-westward of Cooper reef. A small coral reef, with a depth of 5 feet (1^{m}5) over it, lies about half a mile northward of Batu Malang (*Lat. 3° 15′ S., Long. 107° 29′ E.*).

Karang Tiga, a coral reef with a least depth of one fathom (1^{m}8) over it, is situated about 1¾ miles north-westward of Batu Malang.

Kurier droogte, about 3 miles northward of Batu Malang, is a reef which dries; it is connected to the reef on which Batu Malang lies by a narrow ridge with depths of from 4¼ to 5½ fathoms (7^{m}8 to 10^{m}1) over it. The summit of Beluru, a mountain 1,181 feet (360^{m}0) high, situated about 6½ miles north-eastward of Tanjong Genting, in line with the northern point of Seliu, bearing about 077°, leads about 2 cables southward of Kurier droogte. A detached shoal, with a depth of 2½ fathoms (4^{m}6) over it, lies about a quarter of a mile westward of Kurier droogte. *See* view facing page 131.

Teree riffen, about 2½ miles northward of Kurier droogte, consist of several reefs which dry; a black iron beacon, surmounted by a truncated cone, marks the westernmost reef. There is a 3-fathom (5^{m}5) patch about three-quarters of a mile north-north-eastward of the beacon. The centre of Bagienda (*Lat. 3° 13′ S., Long. 107° 37′ E.*) in line with the northern point of Seliu, bearing about 104°, leads between Teree riffen and Kurier droogte in a least depth of 3¾ fathoms (6^{m}9), soft bottom. *See* view facing page 131.

Zuid rif, about 3½ miles north-westward of Teree riffen, dries. In 1950, the reef was reported to have extended northward and southward and, at high water, to be marked by a dark brown discoloration and tide rips.

Narrows of Stolze straat.—Light.—Beacon.—Lima eilanden, on the eastern side of the narrow part of Stolze straat, are all low, covered with high trees, and surrounded by coral reefs which dry; there are narrow, deep passages between the islands. Bamidjo (Bamijo). Benolo, Bago, and Kasenga form the western group, which is separated from the eastern group, consisting of Bujut (Ringet) and Lima (Betong), by a deep channel about three-quarters of a mile broad.

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Chart 2137.

Lumba (Tuan), which dries, is situated about 6 cables south-eastward of Bamidjo, and a reef, with a depth of 1¾ fathoms ($3^{m}2$) over it, lies about 3 cables westward of the latter island. Two reefs, with less than 6 feet ($1^{m}8$) over them, lie about half a mile south-south-westward and southward, respectively, of Kasenga. Except for the last three reefs, the western side of the Lima eilanden appears to be clear, but eastward of the line joining Kasenga and Tanjong Ajer Lantjur there are numerous reefs, and this area should be avoided as much as possible ; the westernmost of these dangers is a reef, with a depth of 2 feet ($0^{m}6$) over it, lying about 1½ miles north-north-eastward of Kasenga ; the positions of the remainder are best seen on the chart. A bank, with a depth of 12 fathoms ($21^{m}9$), was reported, in 1948, to lie about 3½ miles west-south-westward of Kasenga.

Geresik (Gresik), on the western side of the narrows, is a low but thickly wooded island, surrounded by a steep-to reef. A reef, with a least depth of 2 fathoms ($3^{m}7$) over it, lies nearly half a mile south-south-eastward of Geresik. The eastern side of this island should be given a berth of at least half a mile owing to off-lying dangers. Aur and Kelemar have been described on page 125 ; a reef, with a depth of 1¾ fathoms ($3^{m}2$) over it, lies nearly one mile eastward of Aur, and there is a reef, with a depth of 1¾ fathoms ($3^{m}2$), about three-quarters of a mile east-north-eastward of Kelemar. Generaal Hewitt reef, also on the western side of the narrows, has been described on page 125.

Mendanau, on the eastern side of Stolze straat, is the largest of the islands fronting the west coast of Billiton, and lies with Tanjong Ajer Lantjur, its western extremity, about 8¼ miles north-eastward of Kelemar ; it is wooded throughout, and is hilly on the western and north-western sides. Petaling, one of the highest peaks, is 676 feet ($206^{m}0$) high and is situated nearly in the middle of the island ; Sagoweel, about 2 miles south-eastward of Tanjong Ajer Lantjur, is 630 feet ($192^{m}0$) high and has a rounded summit. The coast of the island is generally low, with occasional rocky points. Nasi (Nasik), the principal village, is situated on the northern coast, and Suak Gual is on the south-western coast.

Tanjong Ajer Lantjur (Ayer Lanchur) (*Lat. 2° 53′ S., Long. 107° 21′ E.*) is a high, blunt point, fringed by a narrow, steep-to reef, and a detached reef lies about one cable south-westward of the point. The entire coast of the island northward and southward of Tanjong Ajer Lantjur is fringed by reefs and rocks, some of them lying as much as 1½ miles offshore. Peling is a small islet on a reef which dries situated about 2½ miles south-south-eastward of Tanjong Ajer Lantjur and about one mile offshore. Kembung (Hoog eiland), nearly 1½ miles northward of this point, is 194 feet ($59^{m}1$) high and has the form of a sugarloaf ; it lies on the north-western part of a reef which dries and is very prominent.

A light is exhibited, at an elevation of 200 feet ($61^{m}0$), from a white iron tower, 88 feet ($26^{m}8$) in height, situated on Tanjong Ajer Lantjur.

Nado is a low, wooded island separated from the south-eastern side of Mendanau by Selat Nado ; owing to the numerous reefs which lie off the south-western entrance, this channel is inaccessible except to small craft with local knowledge. A reef on the southern side of the channel and about 3 cables off the northern coast of Nado is

Charts 2149, 941a, 1263.

Chart 2137.

marked by a white iron beacon surmounted by a ball. Close northward of this beacon is a 2-fathom ($3^{m}7$) patch.

Batu Dinding is separated from the northern coast of Mendanau by Selat Nasi (Nasik), a narrow channel only navigable by praus. This island is hilly on the western side, which is indented by a shallow bay, and low on the eastern side; the northern and western coasts are rocky. Langir is a rocky islet, 171 feet ($52^{m}1$) high, lying off the entrance to the bay on the western coast of Batu Dinding; it is surrounded by a reef which dries, and on the western extremity of this reef is Malang Wangkang (Wankang), a rock covered with vegetation. Tanjong Ajer Lantjur in line with Kembung (Hoog eiland), bearing about 180°, leads fully one mile westward of Malang Wangkang and also clear of the reefs which lie between Langir and Kembung (Hoog eiland). The reefs eastward and north-eastward of Batu Dinding are described on page 135.

Northern part of Stolze straat.—Dangers.—Beacons.—Light.—Akbar droogte, about 12 miles north-westward of Langir, has been described on page 125.

There are few landmarks on the northern part of the western coast of Billiton, between Tanjong Kubu, a rocky point situated about 12½ miles east-north-eastward of Batu Dinding, and Tanjong Kelajang, nearly 10 miles north-north-eastward. The most noticeable mountain is the double-peaked Tadjem (chart 2160), situated nearly in the middle of Billiton; Tadjem Laki, the south-eastern peak, 1,660 feet ($506^{m}0$) high, is a sharp cone; Tadjem Bini, the north-western peak, 1,647 feet ($502^{m}0$) high, consists of a narrow ridge which appears sharp when seen from eastward or westward, but is blunt and somewhat rounded from northward and southward. Tobalo, about 4½ miles southward of Tanjong Kelajang and 1½ miles inland, has three rugged peaks, the southern, 535 feet ($163^{m}1$) high, being the highest; they are very prominent when seen from westward and are visible from a distance of 28 miles in clear weather, but are not easy to identify from northward. Buling, 368 feet ($112^{m}2$) high, about 2 miles north-westward of Tobalo, is of a regular dome-shape when seen from northward or westward.

The coast between Tanjong Kubu and Tanjong Binga, a high point about 6 miles northward, is low and is fringed by a bank which dries out as much as one mile in places; several rocks, the outer one being covered with vegetation, lie on this bank off Tanjong Kubu (*Lat. 2° 42′ S., Long. 107° 37′ E.*). Numerous unmarked shoals and reefs lie off this part of the coast, and only the outer dangers are described here, the positions of the remainder are best seen on the chart.

Six beacons, marking dangers between Tanjong Kubu and Tanjong Binga, stand from about half a mile to one mile offshore. Three of these beacons, each fitted with a rectangular topmark, stand about one mile north-north-westward of Tanjong Kubu, and about 1½ miles westward and 1¾ miles north-westward of Tanjong Batu Hitam, a point about 3¾ miles north-north-eastward of Tanjong Kubu. The remaining three beacons, each fitted with a ball topmark, stand about one mile and three-quarters of a mile south-westward, and 6 cables west-south-westward of Tanjong Binga.

Tandjung Pandan, with the dangers in the approach, is described on pages 136-138.

Charts 2149, 941a, 1263.

Chart 2137.

Sri Blitong, with a least depth of 1¾ fathoms ($3^{m}2$) over it, is situated about 5 miles north-westward of Tanjong Kubu ; a 5½-fathom ($10^{m}1$) patch lies about 1¼ miles south-westward, and a 2½-fathom ($4^{m}6$) patch about 6 cables south-south-eastward of this reef. Sri Tadjem (Tajem), about 4½ miles west-south-westward of Tanjong Binga, has a depth of 2¾ fathoms ($5^{m}0$) over it ; a 3¾-fathom ($6^{m}9$) patch lies about 6 cables south-south-westward, and a 2½-fathom ($4^{m}6$) patch about three-quarters of a mile south-eastward of this reef. Sri Manggar, nearly 3½ miles westward of Tanjong Binga, has a depth of 3¾ fathoms ($6^{m}9$) over it ; a 2¾-fathom ($5^{m}0$) patch lies about 2 cables north-westward of a rock, with a depth of 3 feet ($0^{m}9$) over it, situated about 1½ miles eastward of Sri Manggar (*Lat. 2° 37′ S., Long. 107° 34′ E.*). A 3¼-fathom ($5^{m}9$) patch lies about 3 cables eastward of Sri Manggar.

Argo riffen are a number of reefs, with a least depth of 2 feet ($0^{m}6$), lying from one to 1½ miles south-eastward of Sri Manggar. A shoal, with a depth of 1¼ fathoms ($2^{m}3$) over it, lies about half a mile north-eastward of Argo riffen.

A number of islets, mostly hilly, and with many reefs around, lie off the north-western extremity of Billiton. Kerah (Langir), the southernmost of these islets, lies nearly half a mile north-westward of Tanjong Djemang, situated about 7 cables northward of Tanjong Binga. Lutung (Lutong), about 4 cables westward of Kerah, is covered with high vegetation. Farther northward are Burung, Pegadur, and Kepajang (Kepayang), all of which, as well as Kerah and Lutung, lie on the coastal reef which extends nearly 2 miles from the coast between Tanjong Djemang and Tanjong Kelajang. Kepajang has a hill, 119 feet ($36^{m}3$) high, on its northern part, and its western coast is rocky ; it is surrounded by a large coral reef, which dries, and on the northern extremity of this reef is an islet with a high rock close off it. Malang besar, about three-quarters of a mile north-north-westward of Burung, has two isolated coconut trees on it. Malang kechil, about half a mile westward of Malang besar, is a smooth, shining rock just above water ; about one cable northward of it is a rock which dries. Several reefs lie within a distance of 1½ miles south-south-westward of Malang kechil. Langkuas is situated about one mile northward of Malang besar and is hilly ; it is surrounded by a steep-to coral reef which partly dries, having two islets and some rocks on it. A 4¼-fathom ($7^{m}8$) patch lies about 2 cables north-westward of Langkuas, and there are several shoals within a distance of half a mile southward and eastward of the island.

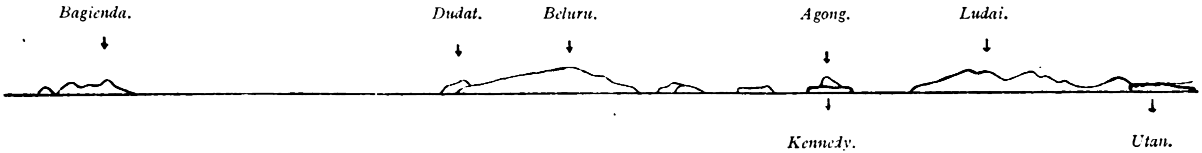
A shoal, dangerous to navigation, was reported, in 1952, to lie about 12½ miles west-north-westward of Langkuas.

A light is exhibited, at an elevation of 196 feet ($59^{m}7$), from a white iron tower, 187 feet ($57^{m}0$) in height, situated near the eastern end of Langkuas (*Lat. 2° 32′ S., Long. 107° 37′ E.*).

Alwina, a shoal of stone and coral about 1¼ miles north-north-eastward of Langkuas, has a depth of 1¾ fathoms ($3^{m}2$) over it, and is not marked by surf or discoloration ; it is the northernmost danger in this locality. A 3¼-fathom ($5^{m}9$) patch lies about 7 cables southward of Alwina, and two patches, with depths of 3 fathoms ($5^{m}5$) and 3¼ fathoms ($5^{m}9$) over them, lie within a distance of one mile south-eastward of this reef.

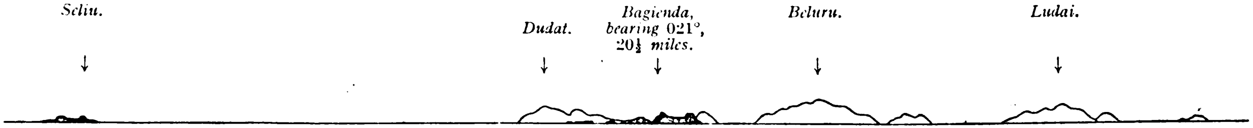
Charts 2149, 941a, 1263.

To face page 130.



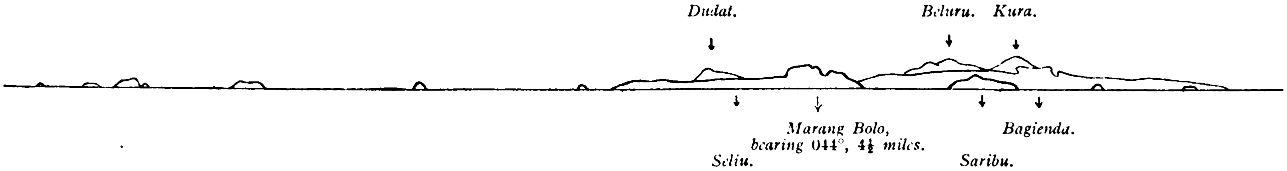
Southern approach to Stolze straat from near Carnbee rocks.

(*Original dated* 1949.)



South-western end of Billiton from westward of Carnbee rocks.

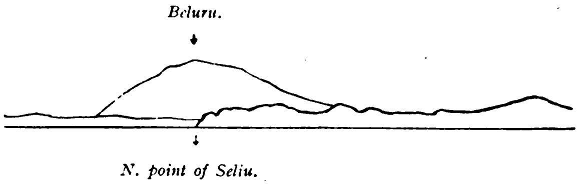
(*Original dated* 1949.)



South-western end of Billiton from south-westward.

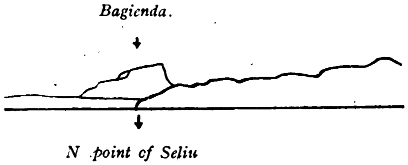
(*Original dated* 1949.)

To face page 131.



Clearing mark for Kurier droogte.

(*Original dated* 1929.)



Clearing mark for Teree riffen.

(*Original dated* 1929.)

Chart 2137.

A 3¾-fathom (6^{m}9) patch is situated about 2 miles eastward of Alwina.

Anchorages.—Anchorage may be obtained, in depths of from 8 to 9 fathoms (14^{m}6 to 16^{m}5), clay with sand, on the eastern side of the bank which extends southward from Ondiepwater eiland, provided that this island bears less than 359°.

There is anchorage westward of Teree riffen, in depths of from 8 to 9 fathoms (14^{m}6 to 16^{m}5), with Lima (Betong) bearing 340°. Also southward of Lima, in depths of from 8 to 10 fathoms (14^{m}6 to 18^{m}3), with the eastern point of this islet bearing 000°, and Bamidjo (Bamijo) bearing 298° ; this position is about three-quarters of a mile southward of the reefs lying southward of Lima, and about 1½ miles north-westward of Zuid rif.

There is good anchorage, in a depth of about 8½ fathoms (15^{m}5), on the ridge which extends southward from Geresik (Gresik), with the eastern side of this islet bearing 355°, and the southern extremity of Aur bearing 293°.

There is convenient anchorage for vessels with local knowledge, in a depth of 8 fathoms (14^{m}6), hard sand, with Kembung (Hoog eiland) bearing 215°, distant about one mile ; also about half a mile eastward of this islet, in a depth of about 11 fathoms (20^{m}1). Care must be taken, however, to avoid the reefs in this locality.

There is good anchorage, in depths of from 8 to 9 fathoms (14^{m}6 to 16^{m}5), sand, about 6 cables southward of Langkuas. This anchorage may be approached from westward by steering for the summit of Kepajang bearing 090°, which leads in mid-channel between Langkuas and Malang kechil, bearing in mind the shoal with a depth of 3 fathoms (5^{m}5) over it, lying about 4½ cables south-south-eastward of Langkuas light-structure (*Lat. 2° 32′ S., Long. 107° 37′ E.*). Care should be taken not to confuse the islet about 3 cables northward of Kepajang with that island ; the islet, which is clear of the land when approaching Kepajang from westward, appears as two hillocks with a low peak in the centre, whilst Kepajang is difficult to discern against the land. A sandy beach on the southern side of Langkuas, and westward of a rock, is the best landing place.

Directions.—*From southward.*—Vessels making for Stolze straat from southward, from Noordwachter (chart 2149) shape course for Larabe shoal during the north-west monsoon, and for Carnbee rocks in the south-east monsoon. In clear weather the mountains in the south-western part of Billiton will be sighted some distance southward of these dangers (*see* views facing page 130) ; Ludai, which may be visible from about 12 miles southward of the Carnbee rocks, first comes into sight, and shortly afterwards Beluru (*Lat. 3° 10′ S., Long. 107° 41′ E.*) will be sighted.

On sighting Beluru it should be brought to bear 030° and kept on that bearing until the vessel is approximately midway between Larabe shoal and Carnbee rocks ; this course leads nearly midway between the 28-foot (8^{m}5) patch (chart 2149), about 12 miles south-westward of Carnbee rocks (page 126), and an obstruction, dangerous to navigation, about 8 miles east-north-eastward of Larabe shoal. Other mountains on Billiton, as well as Ondiepwater eiland and the islet of Kebatu (page 153), should then be sighted, so that in clear weather there is no difficulty in fixing the vessel's position by landmarks.

Charts 2160, 2149, 941a, 1263.

Chart 2137.

Thence a north-north-westerly course should be steered for a position 6 miles eastward of Ondiepwater eiland. A northerly course should then be steered, passing midway between Kasenga and Geresik, and not less than 2 miles westward of Tanjong Ajer Lantjur.

With bad visibility or in thick weather, vessels must depend entirely on sounding; in such cases it is advisable to make the southern edge of the bank, with depths of from 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$), clay with sand, which extends about 28 miles southward from Ondiepwater eiland, by sounding, and then immediately steer eastward until in depths of more than 10 fathoms ($18^{m}3$); then steer northward, taking care to keep in depths of more than 10 fathoms ($18^{m}3$), and, when passing eastward of Ondiepwater eiland, keeping in depths of not less than 16 fathoms ($29^{m}3$). If, however, depths of over 20 fathoms ($36^{m}6$) have been obtained when making for the southern entrance, it may be presumed that the vessel is well over on the eastern side of the channel, and a north-westerly course may then be steered, taking care to keep in these depths. In unfavourable conditions, or if in any doubt as to which side of the strait the vessel may be, it is advisable to anchor; bad visibility does not usually last for any length of time.

At night, Stolze straat can be approached from southward without danger in clear weather, as the light on Ondiepwater eiland is visible up to 3 miles southward of Hancock shoal, the southernmost danger on the western side of the approach. When this light is sighted vessels should steer to pass about 6 miles eastward of Ondiepwater eiland, and thence proceed northward until in the arc of visibility of Tanjong Ajer Lantjur light, which must be kept between the bearings of 003° and 022°. When Geresik is sighted, the vessel's position can be fixed by bearings of this island and Tanjong Ajer Lantjur light, and course may be shaped to pass either eastward or westward of Akbar droogte, according to destination; vessels passing eastward of this shoal have the advantage of being able to fix their position by bearings of Langkuas light in addition to Tanjong Ajer Lantjur light (*Lat. 2° 53′ S., Long. 107° 21′ E.*).

Charts 2137, 2149.

From northward.—Vessels approaching Stolze straat from northward, especially if the vessel's position is not very certain, must give the group of reefs lying between 40 and 50 miles north-eastward of the north-eastern extremity of Banka, described on page 139, a wide berth; farther southward attention must be paid to the dangers lying off the northern entrance to Gaspar straten, described on page 138, the easternmost of which is Canning rock. The isolated reef, with a depth of 13 feet ($4^{m}0$) over it (page 139), lying about 47 miles northward of Langkuas and the shoal, dangerous to navigation, reported to lie about 12½ miles west-north-westward of Langkuas, *see* page 130, must also be borne in mind. If approaching from the north-eastward, Florence Adelaide reef (page 167) must be avoided.

When southward of the line joining Tanjong Berikat and Langkuas the only danger in the northern part of the strait is Akbar droogte, but vessels passing near Langkuas must guard against the peculiar nature of the tidal streams in the vicinity of this islet (*see* page 118), The directions given for Stolze straat from southward can then be followed in the reverse order.

Vessels approaching Stolze straat from north-westward can use

Charts 2149, 941a, 1263.

Charts 2137, 2149.

a route, passing north-eastward of Iwan (page 149) and south-westward of the group of reefs including Enslie and Celestial reefs (page 139), but only by day and in clear weather; for Directions, *see* page 149.

Charts 2137, 2160.

EASTERN SIDE OF GASPAR STRATEN.—Western side of Billiton.—The western coast of Billiton is generally low and wooded, with a few hills and mountains inland which form useful landmarks; as these mountains nearly all run in an east-north-east and west-north-west direction, they show flat summits with gently sloping sides when seen from northward or southward, and appear more pointed, with fairly steep slopes when seen from eastward or westward. Bagienda (Bagenda), about 2 miles north-eastward of Tanjong Genting, the south-western extremity of Billiton, is a rocky hill with two peaks, the western being 509 feet ($155^{m}1$) high and fairly sharp, and the eastern 528 feet ($160^{m}9$) high; at a distance it appears as two hummocks. Beluru, 1,181 feet ($360^{m}0$) high, about 5 miles north-eastward of Bagienda, is a long narrow ridge; the highest peak is rendered prominent by a small wood on the northern side of the ridge, especially when seen from eastward or westward Kura, about one mile eastward of Beluru, is 669 feet ($203^{m}9$) high. Ludai, about 3½ miles eastward of Beluru, has two peaks, the south-western peak being 1,089 feet ($331^{m}9$) high and the north-eastern 1,249 feet ($380^{m}7$) high; it can be clearly distinguished from a distance of 40 miles in clear weather. Dudat, known locally as Kubing, a mountain 1,168 feet ($356^{m}0$) high, situated nearly 7 miles northward of Beluru, has a ridge extending about 5 miles north-eastward from it on which there are a few prominent peaks. Agong, at the north-eastern end of this ridge, has two peaks, the western being the higher and 1,220 feet ($371^{m}9$) high. *See* views facing page 130.

Chart 2137.

Tanjong Genting (Kiras) is a rocky point, and close off it is Genting (*Lat. 3° 15′ S., Long. 107° 37′ E.*), an islet. Tanjong Kiras (Uris) and Tanjong Lantjang, about 1½ and 2¾ miles north-north-westward of Tanjong Genting, are also rocky; some above-water rocks lie close off Tanjong Lantjang. Perut (Prut) a small islet with some above-water rocks off its northern side, is situated close off Tanjong Kiras and there is a stone landing pier at this point.

Tanjong Tambelan, nearly half a mile northward of Tanjong Lantjang, is connected to the shore by a narrow neck of land. Seliu and the off-lying dangers have been described on page 127. The coast between Tanjong Tambelan and Tanjong Borong, about 16 miles northward, is fronted by banks, reefs, and low islands, extending several miles seaward; the positions of these are best seen on the chart.

Telok Brang (Begantung), a large shallow bay, navigable only by praus, immediately southward of Tanjong Borong, is entered by a narrow passage between the islands of Ru and Batang, the northern extremities of which lie about 2¾ miles south-south-westward and 2 miles southward, respectively, of Tanjong Borong; thence this channel leads between the islands of Batang and Bago (Bakou), about half a mile south-south-eastward of Batang. Vessels from southward, of not more than 11 feet ($3^{m}4$) draught, can enter this bay by

Charts 2160, 2149, 941a, 1263.

passing about 2 cables northward of the drying reef, situated about 3¼ miles east-north-eastward of Teree riffen (page 127), and thence steer northward, passing between Bago and Mendulu, situated about 2 miles westward. Both the above routes are only available for vessels with local knowledge.

Straat Mendanau.—Dangers.—Buoys and beacons.—Straat Mendanau, the inshore passage eastward of the Lima eilanden, Nado, and Mendanau, is buoyed and beaconed, and can be safely used by vessels with local knowledge proceeding to Tandjung Pandan from the southern part of Stolze straat; the bottom in the shoaler parts consists of hard sand, and soft clay in the deeper parts.

The southern entrance, between Teree riffen, marked by a beacon (page 127), and Zuid rif, is about 3 miles wide, with depths of from 6 to 8 fathoms ($11^{m}0$ to $14^{m}6$), but a little farther in, a narrow ridge, with depths of from 3¼ to 4½ fathoms ($5^{m}9$ to $8^{m}2$), extends northward from Teree riffen to the reefs which extend nearly 4 miles southward from Nado. Numerous reefs, some of which dry, lie eastward of the Lima eilanden (page 127), and the easternmost of these is about 2¾ miles north-north-eastward of Zuid rif (*Lat. 3° 07′ S., Long. 107° 25′ E.*). The western side of the passage here is marked by a white iron beacon surmounted by a ball, which stands on a reef, which dries, about 2¾ miles south-south-eastward of Tanjong Burung Gantung, the southern extremity of Nado; a reef, with a depth of 3 feet ($0^{m}9$) over it, lies nearly 2 cables south-south-eastward of this beacon.

Mendulu is a low island situated about 4 miles south-eastward of Tanjong Burung Gantung; northward of this island are Keringan and Ru, all three islands lying on a coral reef which dries. Several detached reefs lie westward of Keringan, and the southernmost of these, situated about 3 miles south-eastward of Tanjong Burung Gantung, is marked by a black iron beacon surmounted by a truncated cone.

Sikindang, surrounded by a narrow, steep-to reef, is situated off the north-eastern side of Nado, and is separated from it by a narrow passage with a least depth of 6 fathoms ($11^{m}0$) in the fairway. A reef, which dries, lies about 1¼ miles northward of the northern extremity of Sikindang and is marked by a beacon; a rock awash, about three-quarters of a mile west-south-westward of this reef, is marked by a beacon, consisting of a stake. A reef, which dries, extends nearly one mile northward from Ringgit, an island close southward of Tanjong Borong, and forms the eastern side of the channel here.

Sebongkok and Hoorn eiland are two low islands lying off the eastern side of Mendanau; Hoorn eiland has a prominent hill, 132 feet ($40^{m}2$) high, on its north-eastern extremity. Selat Perlak, which separates Sebongkok from Mendanau, is only navigable by praus. The northern part of the passage between Hoorn eiland and Mendanau is closed by a reef, which dries. A 3¼-fathom ($5^{m}9$) patch and a 4¾-fathom ($8^{m}7$) patch lie, respectively, about 7 cables south-south-eastward and 3 cables eastward of the northern end of Sebongkok. Reefs extend nearly half a mile south-eastward from the eastern end of Hoorn eiland (*Lat. 2° 50′ S., Long. 107° 31′ E.*), and there is a 5½-fathom ($10^{m}1$) patch about half a mile north-eastward of the same point.

Tikus, about 1¼ miles eastward of the northern end of Sebongkok and on the eastern side of the strait, is a small rocky islet, lying on

Chart 2137.

the western edge of a coral reef which dries ; there is a patch of sand, covered with low coconut trees, on the southern extremity of this reef. Drying and sunken rocks extend for about 1¾ miles southward from Tikus. About one mile east-south-eastward of Tikus (*Lat. 2° 51′ S., Long. 107° 32′ E.*) is Gusung Aril, another small islet covered with coconut trees, which lies on the southern end of a large reef which dries. A rock, which dries, is situated about three-quarters of a mile north-eastward of Tikus.

The western coast of Billiton between Tanjong Borong (page 133) and Tanjong Tikar, a rocky point about 8½ miles north-north-eastward, is low and wooded, with some sandy beaches and a couple of hillocks near the coast. It is fringed by a reef which dries, with foul ground for some 2 or 3 miles outside it.

Perlak riffen, one portion of which dries, lie about 2 miles northward of Hoorn eiland and on the western side of the northern entrance to Straat Mendanau ; a white conical buoy, surmounted by a ball, is moored off the north-eastern side of these reefs. A detached reef, with a least depth of 1½ fathoms (2^{m}7) over it, lies about 4 cables eastward of the drying portions of Perlak riffen and nearly 2½ miles northward of the hill on the north-eastern extremity of Hoorn eiland. There are numerous reefs between Perlak riffen and the eastern side of Batu Dinding, and vessels should not, therefore, attempt to pass westward of Perlak riffen. A shoal, with a least depth of 4 fathoms (7^{m}3) over it, lies about 1¼ miles west-north-westward of Perlak riffen, and about 2 miles farther in the same direction is a shoal with a least depth of 3¾ fathoms (6^{m}9) ; 5½- and 7-fathom (10^{m}1 and 12^{m}8) patches lie about 3 cables and 2 miles, respectively, eastward of the latter shoal.

Batu Pinang, a reef which dries, is situated on the eastern side of the channel and about 2½ miles westward of Tanjong Tikar, with several reefs between. A shoal, with a least depth of 2¼ fathoms (4^{m}1) over it, lies nearly 3½ miles westward of Tanjong Tikar, and its south-western side is marked by a black iron beacon surmounted by a truncated cone ; close eastward of this shoal is a rock awash, and two other shoal patches lie between it and Batu Pinang.

Kelmanbang lies with its eastern extremity about 2¾ miles west-north-westward of Tanjong Tikar, and is covered with vegetation, with some coconut trees on its southern and eastern sides ; there is a hill, 158 feet (48^{m}2) high, on its western part, and the island is surrounded by a reef which mostly dries. Ulur Bulu (Ulu Buloh) is a wooded, rocky islet, surrounded by a drying reef, about 1½ miles eastward of Kelmanbang. Djumangin, a rock awash, with shoal patches northward of it, lies about 5 cables westward of Kelmanbang ; a black can buoy, surmounted by a truncated cone, is moored about 3 cables west-south-westward of the rock. A shoal, with a least depth of 2¾ fathoms (5^{m}0) over it, lies nearly 8 cables north-westward of the north-western extremity of Kelmanbang ; there are two shoals, with depths of 1¼ fathoms (2^{m}3) and 2½ fathoms (4^{m}6) over them, respectively, about 3 cables north-westward of the island.

Batu Tuku, a reef which dries, is situated about half a mile northward of Kelmanbang (*Lat. 2° 47′ S., Long. 107° 32′ E.*). A shoal, with a least depth of 2¾ fathoms (5^{m}0) over it, lies westward of Batu Tuku and about 1½ miles north-westward of the north-western extremity

Charts 2160, 2149, 941a, 1263.

of Kelmanbang. About 6 cables north-north-westward of this shoal is a shoal, with a least depth of 2 fathoms ($3^{m}7$) over it, with a 2¾-fathom ($5^{m}0$) shoal about 2 cables south-south-eastward of it. There are several shoal patches and small reefs northward and eastward of Batu Tuku, and their positions are best seen on the chart.

A patch, with a least depth of 2½ fathoms ($4^{m}6$) over it, lies about 1¾ miles north-westward of Batu Tuku, and about a quarter of a mile north-westward of it is a large shoal with a least depth of 1¼ fathoms ($2^{m}3$) over it. About 6 cables further in the same direction lies a shoal with a least depth of 2¾ fathoms ($5^{m}0$) over it; this is the north-westernmost shoal in the approach from the southward to Rede Tandjung Pandan.

Directions.—To pass through Straat Mendanau from southward, a vessel should steer northward so as to pass about half a mile westward of the beacon on Teree riffen (*Lat. 3° 09′ S., Long. 107° 27′ E.*), and when the southern point of Mendulu bears 040°, steer for it on this bearing, thus crossing the ridge between Teree riffen and Nado in a least depth of 4½ fathoms ($8^{m}2$).

After crossing the ridge she should steer 005°, when the white beacon southward of Nada and the black beacon north-westward of Mendulu will soon be seen. The vessel should pass between these beacons, and thence steer north-north-eastward to pass midway between Sikindang and Ringgit, and thence midway between Sebongkok and Tikus, taking care to avoid the 3¼-fathom ($5^{m}9$) and 4¾-fathom ($8^{m}7$) patches lying nearly half a mile off the eastern coast of Sebongkok.

The vessel should then pass westward of the black beacon marking the shoals westward of Batu Pinang, and westward of the black buoy west-south-westward of Kelmanbang. The eastern extremity of Sebongkok in line with the eastern extremity of Hoorn eiland, bearing about 178°, leads about 3 cables eastward of the detached shoal, with a least depth of 1½ fathoms ($2^{m}7$) over it, which lies eastward of Perlak riffen. Thence the vessel should pass close north-eastward of the white buoy moored about 7 cables north-eastward of the drying portion of Perlak riffen, and thence westward of the north-westernmost shoal about 2¾ miles north-westward of Batu Tuku. If the vessel is bound for Rede Tandjung Pandan, after rounding the north-westernmost shoal she should steer east-north-eastward so as to pass northward of the light-buoy off this roadstead.

Rede Tandjung Pandan.—Between Tanjong Tikar and Tanjong Kubu (page 129), nearly 6 miles north-north-eastward, there is a slight indentation in the coast, into which Sungei Tjerutjup (Cheruchup) flows; except for a narrow channel leading to the mouth of this river, almost the whole of this indentation is occupied by a coastal reef which dries, and which extends fully 3 miles westward from the southern entrance point of the river. Outside the coastal reef are numerous detached reefs, the positions of which can best be seen on the chart, and between them is a narrow channel which leads to the inner road.

The shore is low and wooded; Pajung (Payung), a hill 198 feet ($60^{m}4$) high, is situated on the eastern side of the river entrance. Kelemmoa is an islet on the southern side of the channel to the river and about one mile westward of its southern entrance point, and a

Chart 2137.

white pyramid, visible 12 miles, is erected on its summit. A pier extends from the northern side of the islet.

Tandjung Pandan, the headquarters of a Government official, is situated on the northern side of the mouth of Sungei Tjerutjup, and contains a hospital; there is also a harbour doctor. Two piers extend southward into the channel of the river, where there are depths of from 5 to 10 feet (1^{m}5 to 3^{m}0) over a narrow area; in case of necessity boiler water can be obtained from a pipe on the head of the western pier, which is private. Provisions are obtainable in limited quantities. There is a small dry dock near the redoubt in the eastern part of the town. Tandjung Pandan is connected to the general telegraph system, and there is telephonic communication with various places in Billiton; there is regular steamer communication with other ports in the Eastern Archipelago. There is an airport about 7½ miles from Tandjung Pandan; it is in regular air-communication with Java, Banka, Palembang and Singapore.

The climate at Tandjung Pandan is unfavourable; the most prevalent diseases are fever and beri-beri.

For the description of the western side of Billiton northward of Tanjong Kubu, *see* pages 129-131.

Light.—Dangers.—Buoyage and beacons.—A light is exhibited, at an elevation of 30 feet (9^{m}1), from a white framework beacon, 26 feet (7^{m}9) in height, situated on the coastal reef about one mile north-westward of Kelemmoa (*Lat. 2° 45′ S,, Long. 107° 37′ E.*).

Two shoals, with depths of 4¼ fathoms (7^{m}8) over them, lie about 4¾ miles west-north-westward of the light-beacon; these and the north-westernmost shoal described on page 136 are the outermost dangers in the channel to Tandjung Pandan. A shoal, with a least depth of 1½ fathoms (2^{m}7) over it, lies about 4 miles north-westward of the light-beacon, and on the northern side of the channel.

Baka, a group of shoals, including two rocks, with depths of less than 6 feet (1^{m}8) over them, lie from one to 1½ miles eastward of the 1½-fathom (2^{m}7) shoal.

A light-buoy, painted white, exhibiting a *white flashing* light, showing *one* flash of *four seconds* duration *every sixteen seconds*, is moored on the northern side of a shoal, with a least depth of 3¾ fathoms (6^{m}9) over it, situated about 3¼ miles west-north-westward of the light-beacon and on the southern side of the channel.

Karang Tengah, with a depth of 2¾ fathoms (5^{m}0) over it, lies about 2¾ miles west-north-westward of the light-beacon and on the southern side of the channel; there are several shoals with depths of from 1½ to 2½ fathoms (2^{m}7 to 4^{m}6) over them, within a distance of 1¼ miles east-south-eastward and half a mile southward of Karang Tengah.

Mangkok besar, with a least depth of 1½ fathoms (2^{m}7) over it, lies on the northern side of the channel and about 2 miles north-westward of the light-beacon; a black can buoy, surmounted by a truncated cone, is moored about 3 cables southward of this shoal.

A light-buoy, painted white, exhibiting a *white flashing* light, showing *one* flash of *three seconds* duration *every twelve seconds*, is moored about one mile west-north-westward of the light-beacon and off the northern side of Batu Kidjang, the north-western extremity of the coastal reef which extends from the southern entrance point of the river.

The narrow channel along the northern side of Batu Kidjang, which

Charts 2160, 2149, 941a, 1263.

Chart 2137.

leads to the inner anchorage, is marked on the northern side by three black beacons, each surmounted by a truncated cone; the southern side is marked by two white beacons, each surmounted by a ball.

Across the entrance to the channel from the inner anchorage to the river there is a bar of hard sand and stones, with a least depth of 2 feet ($0^{m}6$), which extends nearly half a mile north-westward from Kelemmoa; this bar is steep-to on its north-western side.

A white conical buoy, surmounted by a ball, is moored on the bar about 6 cables north-westward of the beacon on Kelemmoa (*Lat. 2° 45′ S., Long. 107° 37′ E.*).

Anchorages.—Directions.—The limits of Rede Tandjung Pandan are: the parallel through the rocky islet about half a mile south-westward of Tanjong Kubu; the parallel through Pajung; the meridian through the eastern extremity of Kelmanbang.

The anchorage for large vessels of deep draught is about 6 cables eastward of the outer light-buoy in a depth of about 8 fathoms ($14^{m}6$).

The best anchorage for vessels of moderate size is about midway between the black buoy southward of Mangkok besar and the inner light-buoy, in a depth of about 6½ fathoms ($11^{m}9$), sand, bearing in mind the 4¼-fathom ($7^{m}8$) shoal in the fairway here. This anchorage is, however, unsafe during the west monsoon, and vessels then anchor near the island of Sebongkok, in the northern part of Straat Mendanau.

The inner anchorage is in a fairly wide basin, with a least depth of 3¼ fathoms ($5^{m}9$), close eastward of the light-beacon, but the channel leading to it is only about one cable wide off the first black beacon. There is sufficient space in this basin for three small vessels, and it affords good shelter in the south-east monsoon.

Vessels making for the roadstead pass northward of the two light-buoys and southward of the black buoy. The outer three beacons on the northern side of the channel leading to the inner anchorage must be given a berth of half a cable, and the first beacon on the southern side a berth of a quarter of a cable.

Climatic table.—*See* page 39.

ISLANDS AND DANGERS NORTHWARD OF GASPAR STRATEN.—Boompjes eiland, about 9½ miles north-eastward of Tanjong Berikat (page 121), is a bare rock about 33 feet ($10^{m}1$) high, surrounded by a reef which extends about half a mile from its south-eastern side; it is visible from a distance of about 10 miles in clear weather. A detached reef, with a depth of less than 6 feet ($1^{m}8$) over it, lies nearly half a mile eastward, and there is a 4¼-fathom ($7^{m}8$) patch about three-quarters of a mile north-westward of the island.

Gaspar island, known locally as Gelasa, about 6½ miles north-eastward of Boompjes eiland, is a thickly wooded island with a sharp summit, 771 feet ($235^{m}0$) high, and is plainly visible in clear weather from a distance of about 30 miles; it is surrounded by a coral reef, which extends about half a mile from its eastern extremity. Gelasa (Glassa) rots, about one mile westward of the western extremity of Gaspar island, is a bare rock 27 feet ($8^{m}2$) high.

Canning rock, about 10 miles eastward of Gaspar island (*Lat. 2° 25′ S., Long. 107° 05′ E.*), has a least depth of 2¾ fathoms ($5^{m}0$), coral, over it; it is steep-to and is not marked by discoloration or ripples.

For the shoal, dangerous to navigation, reported to lie about 12½ miles

Charts 2160, 2149, 941a, 1263.

Chart 2137.

west-north-westward of Langkuas and about the same distance east-south-eastward of Canning rock, *see* page 130.

Warren Hastings reefs consist of six coral patches with depths of from less than 6 feet ($1^{m}8$) to 2¾ fathoms ($5^{m}0$) over them, and are barely visible; the south-western patch lies about 7½ miles west-north-westward of Gelasa rots.

Tiung (Tijong) reef lies about 9½ miles northward of Gelasa rots and has a depth of 3 feet ($0^{m}9$) over it; it is barely visible. Teree reef, about 2 miles north-eastward of Tiung reef, is a bank which dries, with some rocks on it, surrounded by a coral reef which extends about half a cable from the drying portion; there is a depth of 4¼ fathoms ($7^{m}8$) close south-eastward of it. Several shoals, with depths of from one to 4 fathoms ($1^{m}8$ to $7^{m}3$) over them, lie within 3 miles south-westward and 2 miles westward of Teree reef.

Belvedere rock, about 2 miles northward of Teree reef, is a black rock about 7 feet ($2^{m}1$) high surrounded by a coral reef. A rock, with a least depth of one foot ($0^{m}3$) over it, is situated about 4 cables north-north-eastward, and two patches, with depths of less than 6 feet ($1^{m}8$) and 3¼ fathoms ($5^{m}9$) over them, respectively, lie within one mile eastward of Belvedere rock.

Magdalen reef, about 10 miles northward of Belvedere rock, has a depth of 2¼ fathoms ($4^{m}1$) over it, is steep-to, and is not marked by discoloration or ripples.

Chart 2149.

Lanrick reef, about 9½ miles northward of Magdalen reef, has a least depth of 8 feet ($2^{m}4$) over it, is steep-to, and is not marked by discoloration or ripples.

A reef, with a depth of 13 feet ($4^{m}0$) over it, lies about 35 miles east-north-eastward of Lanrick reef and nearly 47 miles northward of Langkuas (*Lat. 2° 32′ S., Long. 107° 37′ E.*); there is an obstruction, dangerous to navigation, about 3 miles south-eastward of this reef.

Reefs north-eastward of the north-eastern extremity of Banka.—Between Lat. 1° 04′ S. and 1° 14′ S., and Long. 106° 30′ E. and 106° 48′ E., is a group of small, steep-to reefs, not marked by discoloration. Enslie reef, the westernmost of these, lies about 43 miles east-north-eastward of Tanjong Grasak, the north-eastern extremity of Banka, and has a depth of 29 feet ($8^{m}8$) over it.

Ingram reef, with a depth of 3 feet ($0^{m}9$) over it, is situated nearly 4½ miles east-north-eastward of Enslie reef, and two patches, with depths of 19 and 29 feet ($5^{m}8$ and $8^{m}8$) over them, lie, respectively, about 2¼ miles eastward and 1¾ miles east-south-eastward of Ingram reef.

Rifleman reef, the northernmost of the group, with a depth of 52 feet ($15^{m}8$) over it, is nearly 2½ miles north-eastward of Ingram reef. Vega reef, about 3½ miles east-south-eastward of Ingram reef, has a depth of 16 feet ($4^{m}9$) over it; a shoal, with a depth of 10 feet ($3^{m}0$) over it, lies about 2½ miles south-eastward of Vega reef.

Hawkins reef, about 3¼ miles eastward of Vega reef, has a least depth of 26 feet ($7^{m}9$) over it. Wild Pigeon reef, with a depth of 6 feet ($1^{m}8$) over it, lies about 4 miles southward of Hawkins reef. Deva reef, about 5½ miles east-south-eastward of Hawkins reef, has a least depth of 15 feet ($4^{m}6$) over it.

Celestial reefs (*Lat. 1° 12′ S., Long. 106° 47′ E.*), with a least depth

Charts 2149, 941a, 1263.

Chart 2149.

of 6 feet ($1^{m}8$) over them, are the easternmost of the group and lie between 2 and 3 miles southward of Deva reef.

Charts 2137, 2149.

NORTH-EASTERN SIDE OF BANKA.—Caution.—A great number of islets, banks, and reefs lie off the north-eastern coast of Banka, up to a distance of about 27 miles offshore. The outermost of these dangers are van Sittard rif; a coral reef about 5 miles northward of van Sittard rif, Keuchenius rif, and Severn reef, *see* pages 142, 149. There are two safe, buoyed channels leading between these reefs to Pangkal Pinang (page 143). No vessel should attempt to proceed between these reefs by any other route; a number of new dangers were found during the last survey of these waters, and even the most accurate survey does not exclude the possibility of the existence of further dangers. The reefs are all steep-to, and, owing to the somewhat troubled water, are only slightly marked by discoloration under the most favourable circumstances. When fixing the vessel's position by bearings of points and islands it must be borne in mind that, since the survey in 1910, muddy points of land and sandy islands may have worked out eastward.

The coast throughout is low and wooded, with a few hillocks close to; farther inland there are mountains which are visible far seaward. A few small rivers flow out, the principal being the Sungei Koba, the Sungei Kurouw, the Sungei Baturusa, and the Sungei Mapor.

Mountains.—The summit of Pading gebergte, 2,408 feet ($734^{m}0$) high, is situated about 19½ miles westward of Tanjong Berikat, and from northward appears as a broad mountain with a flat top; thence the range extends westward for about 7 miles, with several rounded peaks, to Gebang, a sharp peak 1,158 feet ($352^{m}9$) high. Eastward of the summit of this range is a ridge of hills, with several sharp peaks, including Sapat (Sepat), about 10 miles westward of Tanjong Berikat (*Lat. 2° 34′ S., Long. 106° 51′ E.*), and Telok Batu, about 4½ miles westward of the same point, *see* page 121.

Charts 2757, 2149.

About midway along the north-eastern side of Banka, and southward of Pangkal Pinang, is Lapa gebergte, a range which rises at the southern end to Mangkol, 1,375 feet ($419^{m}1$) high, the highest and most prominent peak of the range, situated about 50 miles north-westward of Tanjong Berikat and about 7 miles inland; at the northern end is Gunung Pau, a peak 919 feet ($280^{m}1$) high, situated about 3½ miles northward of Mangkol. Ladi (Lali), about 4¾ miles east-north-eastward of Mangkol, is 742 feet ($226^{m}2$) high and has a prominent tree on its summit.

Maras gebergte, southward of Klabat baai, has been described on page 113.

Radja (*Lat. 1° 54′ S., Long. 106° 11′ E.*) is a conical hill, 771 feet ($235^{m}0$) high, situated close westward of Tanjong Radja and about 18 miles northward of Ladi. Puak, about 1½ miles westward of Radja and 1,008 feet ($307^{m}2$) high, is steep on the eastern side, and its sharp summit is very prominent. Sambongiri, nearly 5 miles south-westward of Puak, is a conical hill 768 feet ($234^{m}1$) high. Betong, about 2½ miles northward of Sambongiri, has a flat summit 942 feet ($287^{m}1$) high, and is not very prominent. *See* views facing pages 144, 145.

Charts 941a, 1263.

Charts 2757, 2149.

Pandjar, nearly 8 miles north-westward of Betong, has a conical summit with a low range of hills on its eastern side. Besar, about 4 miles northward of Pandjar, is a conical mountain with a rounded summit, appearing as a sharp peak when seen from northward or southward; there is a lower ridge of hills on its south-western side.

Chart 2149.

Currents and tidal streams.—Along the outer edge of the reefs and in the open sea off the north-eastern coast of Banka the streams are largely non-tidal, being caused by the wind-drift, and consequently no reliance can be placed on a position obtained by dead reckoning. Off Tanjong Berikat the monsoon current may attain a considerable rate.

Charts 2137, 2149.

Coast.—Dangers.—The coast between Tanjong Berikat (page 121) and Tanjong Langka (Lanka), about 25 miles west-north-westward, is low and swampy in places. The coast for 7 miles eastward of Tanjong Langka is fronted by numerous reefs, many of which dry, up to a distance of 3½ miles offshore. Karang Timor, the easternmost of these, lies about 6 miles eastward of Tanjong Langka and has a small portion always above water on its south-western side. Karang Perlang, nearly 2 miles north-eastward of Tanjong Langka, also has a small portion above water on its western side. These two reefs, as well as Karang Barat, situated nearly one mile westward of Karang Perlang, are fairly steep-to on their northern sides. By keeping the sharply defined Tanjong Berikat bearing not less than 114°, a vessel will pass well outside these dangers.

Chart 2149.

Rede Koba.—Dangers.—Lights.—Sungei Koba flows out about 2½ miles westward of Tanjong Langka, and Koba is situated on the eastern side of the river a short distance within its entrance. The roadstead is bounded northward by the parallel of 2° 24′ S., eastward by the meridian of 106° 25′ E., and westward by the meridian of 106° 22′ E. It is only calm in the east monsoon; during the west monsoon landing is frequently impossible.

A reef, which dries, lies about 1½ miles north-north-eastward of the mouth of Sungei Koba. A light is exhibited, at an elevation of 32 feet (9^m8), from a white framework beacon, 26 feet (7^m9) in height, situated on the northern extremity of this reef (*Lat. 2° 27′ S., Long. 106° 25′ E.*). A reef, which dries, lies about one mile north-westward of Tanjong Langka, and there are two reefs, which also dry, within a distance of three-quarters of a mile eastward of this reef. Karang Guntreng, which dries, is situated about 2½ miles westward of the light-beacon and 1¼ miles offshore.

The usual anchorage is outside the reefs, about 7 cables north-westward of the light-beacon, in a depth of 3¼ fathoms (5^m9), mud. Small vessels can anchor closer in, within the reefs. The usual landing place, which is marked by a flagstaff, is about half a mile eastward of the mouth of Sungei Koba; a *red* light, privately maintained, is exhibited from this flagstaff at night. The coast here is fringed by a sandbank about half a mile wide, which dries, and the river can only be entered by praus at high water spring tides; in the east monsoon the maximum depth over this bar is 4 feet (1^m2), and 5 feet (1^m5) in the west monsoon.

Charts 941a, 1263.

Chart 2149.

Koba is connected to the general telegraph system. The Customs officer is also the Harbour Master. A harbour doctor is resident here.

Coast.—Off-lying dangers.—The coast between Tanjong Langka and Tanjong Radja, about 38 miles north-north-westward, is low, with occasional rocky points and sandy beaches. Tanjong Pinjak, with Pinjak village close to it, is situated nearly 9 miles west-north-westward of Tanjong Langka; the village of Guntreng lies nearly midway between Koba and Tanjong Pinjak and about half a mile inland. Karang Pinjak, which dries, lies about one mile south-eastward of Tanjong Pinjak. Tanjong Lempujang is a low and rocky point about 11 miles north-north-westward of Tanjong Pinjak; the village of Kurau lies about 4 miles southward of Tanjong Lempujang. Karang Kerandji, a drying reef, is situated about 1½ miles north-north-eastward of Tanjong Lempujang. Tanjong Udang, about 3½ miles north-north-westward of Tanjong Lempujang, is a high rocky point formed by a spur from Ladi (page 140); a drying reef lies about 2 miles northward of Tanjong Udang and half a mile offshore.

Tanjong Bunga, about 4½ miles north-north-westward of Tanjong Udang, projects some distance and is, therefore, prominent. Punai, a low rocky islet, lies about one mile northward of the point and half a cable offshore. Tanjong Radja (*Lat. 1° 54′ S., 106° 11′ E.*) is a very prominent rocky point, rising close within to Radja heuvel.

The whole of this coast is fronted by numerous islets and reefs, some of which have not been thoroughly surveyed. There are, however, two safe channels, which are marked by buoys and beacons, leading to and from Rede Pangkal Pinang; these are:—

(a) Inshore passage from Koba to Pangkal Pinang; *see* page 144.
(b) Pangkal Pinang to Sungei Liat, passing westward of Elliot rif and Pedis Selatan; *see* page 147.

The islets and reefs which lie near these passages are described in their appropriate places hereafter; particulars of the outer reefs only are given here. For islets and reefs westward of the outer reefs, *see* pages 145 to 146.

Charts 2137, 2149.

Van Sittard rif, the south-easternmost of the outer dangers, is situated about 23 miles north-north-westward of Tanjong Berikat and has a depth of 8 feet (2^{m}4) over it. A coral reef, with a least depth of 3 fathoms (5^{m}5) over it, upon which the motor vessel *Rotti* struck, in 1951, was reported to lie about 5½ miles northward of van Sittard rif. Keuchenius rif, about 12½ miles north-westward of van Sittard rif, has a depth of 26 feet (7^{m}9) over it. Oost Hydrograaf rif lies about 5 miles westward of Keuchenius rif and has a depth of one foot (0^{m}3) over it. West Hydrograaf rif, with a depth of 11 feet (3^{m}4) over it, is situated nearly 9 miles north-westward of Oost Hydrograaf rif and about 14 miles eastward of Tanjong Radja (*Lat. 1° 54′ S., Long. 106° 11′ E.*).

Vessels proceeding to and from Gaspar straten must pass well outside these reefs, as the area within them is rendered unsafe by such dangers as Scotia reef, Lombok riffen, Smit van de Brucke (Smit Brucke), Noordziek rif, etc. For description of these dangers, *see* pages 145, 146. The majority of these reefs are only marked by discoloration in very fine weather, and sounding is of no use as a guide;

Charts 2137, 2149.

in clear weather the mountains and hills on Banka can be seen from the outer reefs.

Chart 2149.

Rede Pangkal Pinang.—Islands and reefs.—Beacon.—Buoy.— The limits of Rede Pangkal Pinang, off the mouth of Sungei Baturusa, are: The line drawn from Tanjong Radja to the centre of Pulau Pandjang; the line drawn 056° from the northern entrance point of Sungei Baturusa; and the line drawn 067° from Punai. The roadstead is entirely open in both monsoons.

Several islets lie in or near the roadstead. Pandjang, about 5½ miles east-south-eastward of Tanjong Bunga, and Budjur, about one mile eastward of Pandjang, lie on coral reefs, which dry, and are covered with coconut trees. There is a drying patch about 1½ miles southward of Budjur; the area within 3 miles eastward and south-eastward of this patch has not been examined. Gerek, a large reef which dries, lies about 1½ miles west-north-westward of Pandjang; Gosong, a drying reef with a patch of sand on its southern side, is situated about three-quarters of a mile westward of Gerek, and its south-western extremity is marked by a black iron beacon surmounted by a truncated cone. Karang Kapal lies about 3¾ miles east-north-eastward of Tanjong Bunga and dries; there are several reefs, with depths of only a few feet over them, within a distance of three-quarters of a mile north-eastward and 1¼ miles eastward of Karang Kapal. A can buoy, painted in black and white chequers, surmounted by a truncated cone and fitted with a radar reflector, is moored about three-quarters of a mile northward of the same reef.

Anchorages.—In calm weather vessels with local knowledge can anchor about 1¼ miles north-westward of Karang Kapal, in a depth of 3¼ fathoms ($5^{m}9$), mud, with the northern entrance point of Sungei Baturusa bearing 270°, and the eastern extremity of Pandjang bearing 135°. During the west monsoon there is sheltered anchorage southward of Pandjang, in a depth of 3 fathoms ($5^{m}5$), mud and sand, with Gunung Pau bearing 265°, and the eastern extremity of Pandjang bearing 005°. During the east monsoon there is anchorage between Gerek and Gosong, in a depth of 4 fathoms ($7^{m}3$), with the beacon on the latter reef bearing 290°, distant 6½ cables, mud and sand, and about 2¼ cables off the western side of Gerek; care must be taken, however, to avoid a small steep-to shoal, with a depth of 2¼ fathoms ($4^{m}1$), which lies about 4 cables eastward of the beacon.

Pangkal Balam and Pangkal Pinang.—Depths.—Harbour facilities.—Communication.—Pangkal Balam, where there is a Government wharf and Custom house, is situated about 1½ miles up Sungei Baturusa; the wharf, which is about 150 feet ($45^{m}7$) long, has a depth of about 8 feet ($2^{m}4$) alongside and its downstream end is equipped with a 2½-ton crane. There is a small graving dock for praus here. Good water can be obtained by boats from a water tank at Pangkal Balam.

In 1949 there was a depth of only 1½ feet ($0^{m}5$) on the bar off the mouth of Sungei Baturusa, but deeper water lies within the mouth; the northern entrance point is rendered prominent by a small coconut plantation on it.

Pangkal Pinang (*Lat. 2° 08′ S., Long. 106° 07′ E.*), the headquarters of the Resident of Banka and Billiton, is situated nearly 2 miles

Charts 941a, 1263.

Chart 2149.

southward of Pangkal Balam on a tributary of Sungei Baturusa. It is connected to the general telegraph system and there is a local telephone service; there is regular steamer and aircraft communication with other ports in the Eastern Archipelago and Singapore. Provisions, water and fuel oil are available, the latter in barrels. The Customs officer is also the Harbour Master. There is a hospital and also a harbour doctor.

Goods intended for Sungei Liat (page 146), when the roadstead at that place is unserviceable, can be transported up Sungei Baturusa to the village of Batu Rusa, about 5 miles above Pangkal Balam, and thence sent by road to that place.

Directions.—Vessels coming from Gaspar straten can follow the inshore passage from Rede Koba, *see* below. Vessels from Sungei Liat can use the inshore passage, *see* page 147.

Vessels coming from northward, from the China sea, should steer to pass at least 7 miles eastward of Tanjong Lajang (page 146) and Tanjong Radja; when this latter point bears 270°, a vessel should steer southward for the light-beacon on Elliot rif (page 146) and then follow the inshore channel from Rede Sungei Liat to Rede Pangkal Pinang, and thence to the desired anchorage.

Inshore passage from Koba to Pangkal Pinang.—Beacons.—This route is only suitable to vessels of fairly light draught. There are several islands on the north-eastern side of the channel for fixing the vessel's position, as well as the points on the Banka coast described on page 142. Bebuar, about 11 miles northward of Tanjong Langka (*Lat. 2° 28′ S., Long. 106° 27′ E.*), is a sandy islet covered with high trees, one of which is prominent, and like all the other islands off this coast, is surrounded by an extensive reef, which dries; foul ground extends up to 2¾ miles west-south-westward from Bebuar.

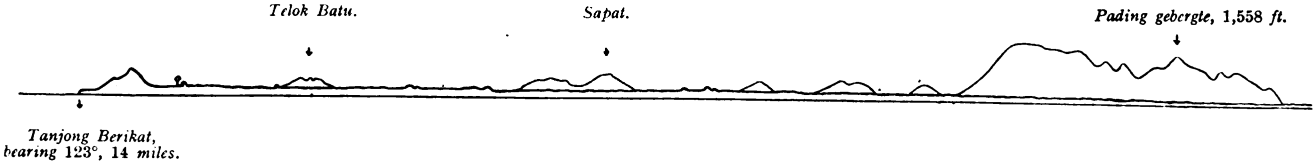
Horse rif, about 2½ miles east-south-eastward of Bebuar, is on the south-western edge of a foul area which extends about 3 miles north-eastward from this reef; it is marked by a black iron beacon surmounted by a truncated cone. Between this area and the foul ground which extends eastward and north-eastward from Bebuar, on which are the reefs Mentawa and Sperwer, there is a narrow passage with a least depth of 46 feet ($14^{m}0$), sometimes used by small vessels with local knowledge proceeding northward from Koba. A reef, with a depth of 7 feet ($2^{m}1$) over it, lies about 2¾ miles south-south-eastward of Horse rif.

Gosong Asam is a large reef, which dries, lying with its eastern extremity nearly 3 miles north-westward of Bebuar, and there are two islets on it. Johora, the western of these, is covered with shrubs, and there are a few coconut trees on its western side; Pasir, the eastern islet, has the same appearance as Bebuar. Ketawi (*Lat. 2° 16′ S., Long. 106° 20′ E.*), about 1¼ miles westward of Johora, is covered with coconut trees, and can be identified by two high trees projecting above the coconut trees. Teali, a reef which dries, is situated about 2 miles north-westward of Ketawi; another reef which dries lies about three-quarters of a mile north-westward of Teali, and a black iron beacon surmounted by a truncated cone stands a short distance within its southern extremity.

Directions.—To enter this channel from south-eastward a vessel should steer for Mangkol bearing 287°, passing about 3 miles southward of Bebuar and 2½ miles southward of Ketawi; if she is coming

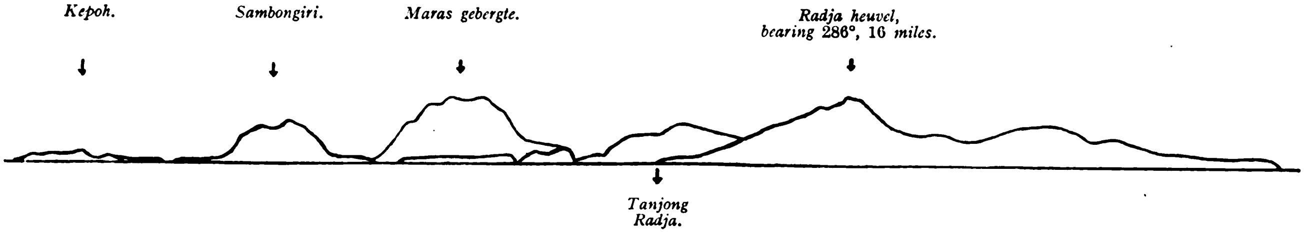
Charts 941a, 1263.

To face page 144.



North-eastern coast of Banka from east-north-eastward of Karang Timor.

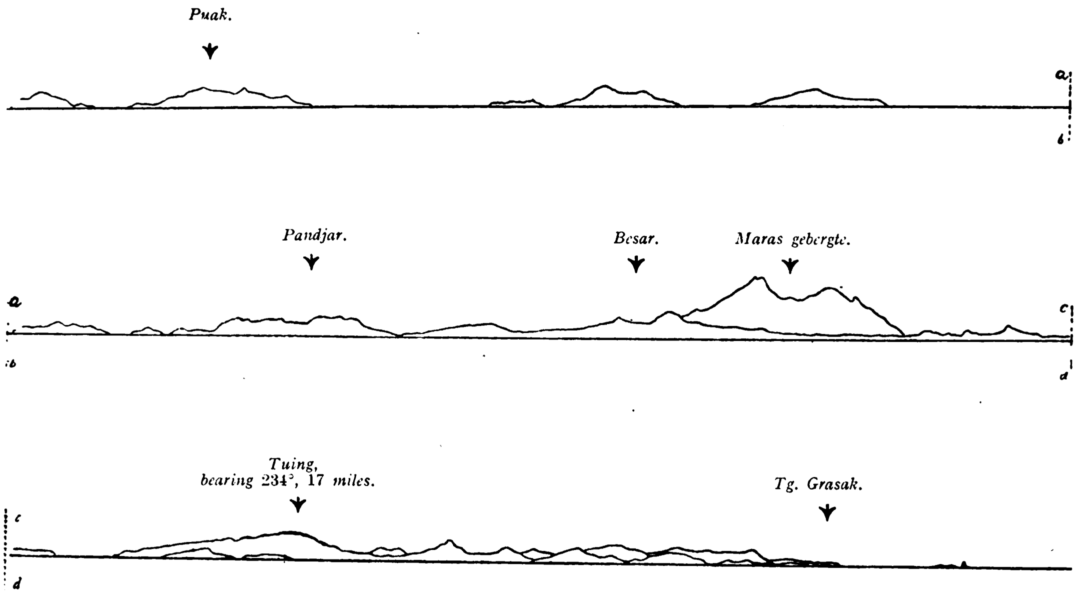
(*Original dated* 1949.)



North-eastern coast of Banka from eastward of Palmer riffen.

(*Original dated* 1949.)

To face page 145.



View, in 3 parts, of north-eastern coast of Banka from north-eastward of Tanjong Tuing.

(*Original dated* 1949.)

Chart 2149.

from Rede Koba she should steer for the position about 2½ miles southward of Ketawi. From this position steer for Tanjong Bunga bearing 322°, which will then be seen nearly in line with Kepoh, a hill 472 feet ($143^{m}9$) high, situated about 10 miles north-westward. When the eastern side of Pandjang bears 000°, it should be steered for on that bearing, passing westward of the black beacon marking the reef north-westward of Teali; this beacon should be given a good berth as the reef projects some distance beyond it.

In the west monsoon vessels can anchor southward of Pandjang. In the east monsoon, to proceed to the anchorage between Gosong and Gerek, or to an anchorage farther northward in Rede Pangkal Pinang, the vessel should continue to steer 000° until the north-eastern slope of Sambongiri is in line with the beacon on Gosong, bearing 325°, which leads south-westward of Pandjang and Gerek in a least depth of 2¾ fathoms ($5^{m}0$), mud and sand. *See* page 143 for details of the above anchorages.

Scotia reef to Pangkal Pinang.—Islets.—Dangers.—Light.—Horse rif, Bebuar, and Gosong Asam have been described with the inshore passage from Koba to Pangkal Pinang.

Scotia reef, with a depth of 16 feet ($4^{m}9$) over it, lies nearly 7 miles north-eastward of Horse rif. Goat reef, with a depth of 3 feet ($0^{m}9$) over it, is situated about 5½ miles northward of Horse rif; the shoal ground extending north-eastward from Bebuar extends to a position about 1¼ miles southward of this reef. The summit of Puak (page 140), bearing 312°, will lead about one mile clear of the foul ground extending north-eastward of Horse rif, but also leads direct onto Goat reef.

Lombok riffen, consisting of three shoal patches, with depths of 8, 10 and 13 feet ($2^{m}4$, $3^{m}0$ and $4^{m}0$) over them, lie, respectively, about 2¾ and 4¾ miles north-eastward and 3¾ miles east-north-eastward of Goat reef. There is a 39-foot ($11^{m}9$) patch nearly 3 miles east-north-eastward of the north-easternmost of these patches.

West Lombok rif, about 5½ miles north-westward of Goat reef, has a depth of 16 feet ($4^{m}9$) over it; a 19-foot ($5^{m}8$) patch lies about 2¾ miles eastward of this reef. The light-structure on Elliot rif in line with the summit of Puak, bearing 315°, leads about half a mile south-westward of West Lombok rif. Fathool Barie, which has a rock which dries on it, is situated about 2½ miles north-north-westward of West Lombok rif. In 1948, a 7-foot ($2^{m}1$) patch was reported to lie about 3½ miles north-north-eastward of West Lombok rif (*Lat. 2° 09′ S., Long. 106° 24′ E.*).

Diederika, a group of rocks one of which is awash, lies about 2 miles north-north-eastward of Fathool Barie, and a patch of coral and stone, with a depth of 6 feet ($1^{m}8$) over it, lies about one mile east-north-eastward of this danger. About 3¾ miles north-eastward of Diederika there is a coral patch with a depth of 11 feet ($3^{m}4$) over it. Smit van de Brucke (Smit Brucke), a coral reef with a least depth of 13 feet ($4^{m}0$) over it, is situated about 6¾ miles eastward of Diederika, and another coral patch, with a least depth of 18 feet ($5^{m}5$) over it, lies about one mile westward of Smit van de Brucke.

Noordziek rif, with a rock awash on it, lies about 2¼ miles northward of Smit van de Brucke.

Elliot rif, which dries, is situated nearly 7½ miles north-westward of West Lombok rif; foul ground extends about 4 miles north-eastward

Charts 941a, 1263.

Chart 2149.

from this reef. A light is exhibited, at an elevation of 33 feet ($10^{m}1$), from a white iron beacon, 26 feet ($7^{m}9$) in height, situated on the south-western side of Elliot rif.

A coral patch, with a depth of 26 feet ($7^{m}9$) over it, lies about 5 miles north-eastward of the light-structure on Elliot rif, and there is a 5½-fathom ($10^{m}1$) patch about 7 miles north-eastward of the same structure. Palmer riffen, a group of coral heads, one of which is awash, lie about 2½ miles northward of the 5½-fathom ($10^{m}1$) patch.

Karang Gading, which dries, is situated nearly 3 miles southward of Elliot rif. The eastern side of the foul ground eastward and south-eastward of Budjur (page 143) extends south-south-eastward from this reef for about 8 miles to the eastern side of Gosong Asam and, amongst other dangers, the reef Karang Senara, which dries, lies within this foul area and about 3 miles south-eastward of Budjur.

Karang Miang (*Lat. 2° 05′ S., Long. 106° 18′ E.*) is situated nearly 2 miles north-westward of Karang Gading and also dries; there is a small reef, with a depth of 4 feet ($1^{m}2$) over it, nearly midway between Karang Miang and Elliot rif. A 4-fathom ($7^{m}3$) patch lies about one mile southward of the light-structure on Elliot rif; for other dangers in the vicinity, *see* page 147.

Charts 2757, 2149.

Rede Sungei Liat.—Dangers.—Buoy.—Tanjong Belajar, nearly 2 miles north-westward of Tanjong Radja, is a fairly prominent steep point, fringed by sunken rocks which extend as much as 4 cables offshore; April rif, with a depth of 6 feet ($1^{m}8$) over it, lies about three-quarters of a mile north-eastward of the point. Tanjong Lajang, about 4½ miles north-westward of Tanjong Belajar, is a rocky point with a low ridge of hills on it, which slopes down gradually to the point and terminates in a flat part; it is fringed by above-water and sunken rocks, which extend as much as 3 cables offshore. Karang Lajang Darat, with a depth of 16 feet ($4^{m}9$) over it, lies about 6 cables south-eastward of Tanjong Lajang, and Karang Lajang Laut, with a depth of 19 feet ($5^{m}8$) over it, is situated about one mile east-north-eastward of this point.

Sungei Liat flows out about 1½ miles south-south-westward of Tanjong Lajang, and the roadstead is off the mouth of this river. A shallow bank of mud, sand and coral, with some above-water rocks on it, fringes the coast in this vicinity; depths of as little as 1½ feet ($0^{m}5$), coral, extend up to 8 cables eastward from the mouth of the river. The limits of the roadstead are: The line drawn from Tanjong Lajang to Tanjong Belajar, and the lines drawn 056° and 112° from the mouth of the river.

Karang Liat lies about 3 miles east-south-eastward of Tanjong Lajang, and has two rocks which dry on it.

Karang Pinakong, about 1½ miles south-eastward of Tanjong Lajang, has a depth of 8 feet ($2^{m}4$) over it; a black can buoy surmounted by a truncated cone is moored off the northern side of this reef. Karang Kapal, with a depth of 16 feet ($4^{m}9$) over it, lies nearly one mile eastward of Karang Pinakong. There is a coral patch, with a depth of 10 feet ($3^{m}0$) over it, about 4 cables south-south-eastward of Karang Pinakong.

The usual anchorage is about one mile offshore, in a depth of about 3¾ fathoms ($6^{m}9$), with Tuing, a hill situated near Tanjong Tuing

Charts 941a, 1263.

Charts 2757, 2149.

(page 149), in line with the outer rocks off Tanjong Lajang (*Lat. 1° 48′ S., Long. 106° 08′ E.*), bearing about 337°. There is a heavy swell during the east monsoon. At the strength of the monsoon there is no communication with the shore; in such circumstances vessels proceed to Rede Pangkal Pinang. As work is carried out day and night in the surrounding mining district, the lights from large arc lamps at these mines are visible from seaward.

Sungai Liat, the capital of the district, is situated on the western bank of the river and about 2 miles from the entrance, and can only be reached by small craft at high water; the channel to the river runs between numerous rocks and is constantly shifting, and there are more rocks farther inside. A Custom house is situated near the mouth of the river. Sungai Liat is connected by road with the principal towns in Banka. Limited quantities of provisions can be obtained. There is a harbour doctor.

Directions.—Vessels making for Rede Sungei Liat from southward should follow the directions given on pages 144-145, 148.

Vessels from northward should pass not less than 2 miles eastward of Tanjong Lajang, as in addition to Karang Lajang Laut there are several shoals with depths of from 3¼ to 4¼ fathoms (5^{m}9 to 7^{m}8) within that distance. Vessels must also take care that the summit of Radja heuvel (page 140) does not bear more than 180°, as a 26-foot (7^{m}9) patch lies about 3¼ miles eastward of Tanjong Lajang. Karang Laut, with a depth of 23 feet (7^{m}0) over it, is situated nearly 4½ miles east-north-eastward of Tanjong Lajang. When Lajang heuvel, 443 feet (135^{m}0) high, situated about three-quarters of a mile westward of Tanjong Lajang, bears 270°, course should be altered for the buoy marking Karang Pinakong, and thence passing northward of it to the anchorage.

Chart 2149.

Channel from Pangkal Pinang to Sungei Liat.—Shoals.—Buoyage.—Shoals, with depths of 2, 1¾ and 2½ fathoms (3^{m}7, 3^{m}2 and 4^{m}6) over them, lie about 7 cables north-westward, 11 cables westward and 6 cables west-south-westward, respectively, of Elliot Rif light-structure (*Lat. 2° 04′ S., Long. 106° 19′ E.*).

A light-buoy, painted black, exhibiting a *red flashing* light showing a flash of *two seconds* duration *every eight seconds*, is moored westward of the above-mentioned dangers, about 1½ miles westward of the light-structure. A 23-foot (7^{m}0) patch lies about 2½ miles westward of the same light-structure.

About 3¾ miles west-north-westward of the light-beacon on Elliot rif is the southern end of a foul area, in which there are numerous sunken rocks, which extends about 1½ miles northward from this position; this foul area lies on the western side of the channel.

Karang Merah, a large drying reef, lies about 5 miles north-eastward of the mouth of Sungei Baturusa (page 143) and about 3 miles offshore; drying patches are situated about 1¼ miles eastward, 1½ miles south-eastward and one mile southward of Karang Merah, with foul ground between them. A drying reef lies about 5 miles south-south-eastward of Tanjong Radja and about 3½ miles eastward of Tanjong Antu, which is a rocky point about 4½ miles south-south-westward of Tanjong Radja; there is a 3-fathom (5^{m}5) patch of coral and sand about 2 miles north-eastward of this reef.

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Chart 2149.

West rif, consisting of coral and stone, with a depth of 6 feet ($1^{m}8$) over it, lies about 6¾ miles north-north-eastward of the light-beacon on Elliot rif and on the eastern side of the channel.

A conical buoy, painted black and white in horizontal bands and surmounted by a ball, marks the north-eastern side of West rif.

Malang Tété, about 2½ miles south-south-eastward of Tanjong Radja, has some above-water rocks on it, which are sometimes visible from a distance of 5 miles. Fokke rif lies nearly one mile north-eastward of Malang Tété and dries.

A 16-foot ($4^{m}9$) patch of coral and stone is situated about one mile south-eastward of Tanjong Radja, and another patch, consisting of coral and sand, with a similar depth over it, lies about one mile north-eastward of the same point. There is a 26-foot ($7^{m}9$) patch about 2¾ miles north-eastward of Tanjong Radja (*Lat. 1° 54′ S., Long. 106° 11′ E.*).

Pedis Selatan lies about 3½ miles eastward of Tanjong Radja, and has a depth of 8 feet ($2^{m}4$) over it; it is marked on its southern side by a can light-buoy, painted black and exhibiting a *white flashing* light showing *one* flash of *two seconds* duration *every eight seconds.* Pedis Utara, with a depth of 3 fathoms ($5^{m}5$), is situated about one mile northward of Pedis Selatan.

Karang Timor Laut, a coral patch with a least depth of 19 feet ($5^{m}8$) over it, lies nearly 2½ miles north-north-westward of Pedis Utara. Bronbeek, with a least depth of 2½ fathoms ($4^{m}6$), is situated about one mile westward of Karang Timor Laut and 3¼ miles north-eastward of Tanjong Belajar; a 3¾-fathom ($6^{m}9$) patch lies about three-quarters of a mile south-eastward of Bronbeek.

Directions.—From the anchorage in Rede Pangkal Pinang, about 3½ miles eastward of the mouth of Sungei Baturusa, *see* page 143, a vessel should steer north-eastward keeping Gunong Pau astern, bearing 230°, until the light-beacon on Elliot rif bears 091° when it should be steered for. When about 4 cables distant from the light-buoy marking the shoals westward of Elliot rif light-beacon, *see* page 147, course should be altered to the north-north-westward until the light-beacon bears 156°, when it should be brought astern and kept on that bearing until about midway between Fokke rif and Pedis Selantan. Thence a north-westerly course should be steered for Karang Liat, taking care to avoid Bronbeek. When Tanjong Radja bears 180° it should be brought astern and kept on that bearing until about three-quarters of a mile past Karang Liat; this will take a vessel about 3½ cables clear eastward of that reef. Thence, passing about one mile northward of Karang Liat, course should be altered to the south-westward so as to bring the buoy marking Karang Pinakong ahead, bearing 240°; thence passing close northward of this buoy to the anchorage off Sungei Liat, *see* page 146. Vessels are advised always to pass northward of Karang Liat when entering or leaving this roadstead.

Chart 2757.

Coast.—Dangers.—The coast between Tanjong Lajang (page 146) and Tanjong Katjur, about 6¾ miles north-westward, is wooded and consists of a sandy beach throughout, except at Tanjong Batu, about midway between these two points, which is rocky.

Two 19-foot ($5^{m}8$) patches lie about 9 cables north-north-eastward and 1¼ miles north-eastward of Tanjong Lajang (*Lat. 1° 48′ S., Long.*

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Chart 2757.

106° 08′ E.) ; depths of less than 5 fathoms (9ᵐ1) extend up to nearly 2 miles east-north-eastward and nearly 2½ miles north-north-eastward of this point. There is an isolated 29-foot (8ᵐ8) patch nearly 3¼ miles north-eastward of Tanjong Lajang.

Tanjong Batu is fringed by a reef on which are several rocks, two of which are covered by high trees ; a foul patch, with some above-water rocks, lies about three-quarters of a mile south-south-eastward of Tanjong Batu.

Chart 2149.

Tanjong Katjur is a low, sandy point ; a sand spit, with a reef which dries on its outer end, extends fully one mile north-eastward from this point, and close outside the reef is Simbang, a small islet lying on a reef. A reef, which dries, lies about 1½ miles eastward of Tanjong Katjur.

The coast between Tanjong Katjur and Tanjong Tuing, about 6 miles northward, recedes slightly, and Sungei Mapor flows out about midway between these two points ; Pangkal Mapor is situated about 3½ miles up this river. Tanjong Tuing is a high, rocky point, with some above-water rocks close off it, of which Ponggul, situated close off the northern side of the point, is the largest. Tuing, a hill 814 feet (248ᵐ1) high, is situated on the northern side of the point. *See* view facing page 145.

The coast between Tanjong Tuing and Tanjong Paku, about 6 miles north-westward, is high and rocky, with an occasional sandy beach. Tanjong Paku is rendered prominent by Paku, a small islet lying close off the point. The shore of the bay between Tanjong Paku and Tanjong Grasak, nearly 5 miles north-westward, consists of a sandy beach, and three small streams flow into the bay. A reef, with a depth of one fathom (1ᵐ8) over it, lies about 2 miles northward of Tanjong Paku, and another reef, with a depth of 1¼ fathoms (2ᵐ3) over it, lies nearly 3 miles north-westward of this point and about 2 miles offshore.

Outlying reefs.—Iwan, a coral reef with a depth of 10 feet (3ᵐ0) over it, is steep-to and situated nearly 15 miles east-south-eastward of Tanjong Tuing (*Lat. 1° 37′ S., Long. 106° 03′ E.*) ; from this reef the Banka coast can generally be seen, so that vessels should have no difficulty in avoiding it.

Severn reef lies about 27 miles eastward of Tanjong Tuing and consists of coral, with a depth of 10 feet (3ᵐ0) over it. Sounding gives no warning of this reef, but in fine weather the highest hill on Tanjong Tuing and the summit of Radja, on Tanjong Radja, are visible from here.

Charts 2137, 2757, 2149.

Directions.—Caution.—By day, and with good visibility, vessels making for Gaspar straten from the vicinity of Toty and Dokan, page 117, can use the passage between Iwan and the group of reefs including Enslie and Celestial reefs (pages 139-140).

By night, or in poor visibility, this route should not be attempted as the dangers are unmarked, and dead reckoning cannot be relied upon owing to the variable tidal streams.

A south-easterly course should be steered for a position about 8 miles south-westward of Lanrick reef, passing about 17 miles north-eastward of Tanjong Grasak (*Lat. 1° 30′ S., Long. 105° 55′ E.*) ; Severn

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Charts 2137, 2757, 2149.

reef may be passed on either side and the 3-fathom (5^m5) patch, about 5½ miles northward of van Sittard rif (page 142), should be given a wide berth. Thence a southerly course may be steered for Tanjong Berikat, passing about 7 miles eastward of van Sittard rif and 6 miles westward of Boompjes eiland.

The dangers westward of this route can be avoided by bearings of the prominent peaks on Banka. The high island of Gaspar will be sighted from abreast Hydrograaf riffen.

Charts 941a, 1263.

CHAPTER VII

BILLITON—STRAAT KARIMATA—WESTERN SIDE OF BORNEO

Chart 2160.

BILLITON.—Billiton, an island forming the western side of Straat Karimata (Carimata), is mostly flat and wooded, with several isolated mountains, but no extensive ranges of them. The island has been greatly developed by the Billiton Company, whose business is dredging for tin, and they have plants all over the island; all the ore is taken to Tandjung Pandan (page 137), and thence shipped to the smelter at Singapore. There are post offices in most of the villages, and there is a telegraph system throughout the island.

The western coast of Billiton has been described with Gaspar straten, in Chapter VI.

Currents and tidal streams.—The horizontal movement of the water close to the coasts of Billiton is a diurnal tidal stream, whilst farther off the eastern coast, in the fairway of Straat Karimata, it is mainly monsoon current, *see* page 9. In the narrow passage between islets and reefs the tidal stream plus current may attain a rate of from 2 to 3 knots.

Off the southern coast of Billiton the tidal streams set westward and eastward to south-eastward; off the eastern coast, northward to north-north-westward and southward to south-eastward; off the north-eastern coast, north-westward and south-eastward; off the northern coast, westward to west-north-westward and eastward to south-eastward.

SOUTHERN SIDE OF BILLITON.—Aspect.—Between Tanjong Genting (*Lat. 3° 15′ S., Long. 107° 37′ E.*), the south-western extremity of Billiton, and Balok baai, in the middle of the southern coast, the mountains lie close to the coast, but eastward of that bay the land near the coast is low, and only two hills are seen inland.

Most of the mountains westward of Balok baai have been described with the western coast of Billiton on page 133. In addition to those previously mentioned are Putat, nearly 2 miles east-south-eastward of Ludai, and Belitung, 446 feet ($135^{m}9$) high, about 3½ miles eastward of Ludai. Eastward of Balok baai are Mengarun, 876 feet ($267^{m}0$) high, situated about 12¼ miles east-north-eastward of Belitung and consisting of three ridges close together; and Tiung, an isolated conical hill, 627 feet ($191^{m}1$) high, about 3¾ miles east-south-eastward of Mengarun.

Coast.—Off-lying islets and dangers.—Tanjong Batu Tungku,

Charts 941a, 1263.

about 1¾ miles eastward of Tanjong Genting, and Tanjong Batu Penju, about 1¼ miles east-north-eastward of the former, are rocky points, and there are numerous above-water rocks on the narrow coastal reef which fringes the coast here and dries; there is a high prominent tree near Tanjong Batu Penju. The coast between Tanjong Batu Penju and Tanjong Rusah, about 11½ miles east-north-eastward, is fringed by a coastal reef, which dries in places, and extends about 2 miles off the latter point.

Masar eilanden consist of four thickly wooded islets, visible about 12 miles. Kennedy, the largest islet, lies about 8 miles south-eastward of Tanjong Genting and is surrounded by a reef which extends about half a mile from its south-eastern side. Utan, about 1½ miles east-south-eastward of Kennedy, is also surrounded by a reef, on the western extremity of which is a small islet; the eastern extremity of Utan is a fairly high, bare ridge of rock. The fourth islet lies about one mile north-westward of Kennedy. There is a detached reef, with a depth of 3 feet ($0^{m}9$) over it, close north-eastward of Kennedy. A 5½-fathom ($10^{m}1$) patch is about 1¼ miles west-south-westward of Kennedy. There is a least depth of 5½ fathoms ($10^{m}1$) between the islands and in their immediate vicinity.

Belatuk (Blatok), a small islet, about 1¼ miles south-eastward of Tanjong Batu Penju, is situated with Gosong Mentigi, another islet, on the western part of a large reef which dries. A drying reef lies about half a mile eastward of Belatuk, and a reef, with a depth of 2 feet ($0^{m}6$) over it, is situated nearly 2 miles southward of the same islet. The islet of Rumput lies about 4 miles eastward of Tanjong Batu Penju, and there is a reef, with a depth of less than 6 feet ($1^{m}8$) over it, about half a mile south-westward of Rumput.

Ketupai, about 4 miles south-eastward of Belatuk, and Kramiah, about 2½ miles north-eastward of Ketupai, are small islets surrounded by reefs. Patches of drying reefs extend about 1½ miles west-north-westward and one mile east-south-eastward from Kramiah (*Lat. 3° 15′ S., Long. 107° 46′ E.*).

Foul ground exists northward of the line joining Belatuk, Rumput and Kramiah.

Balok baai.—Beacons.—Balok baai, entered between Kramiah (*Lat. 3° 15′ S., Long. 107° 46′ E.*) and Tanjong Kelumpang, a rocky point about 13½ miles eastward, is of some importance for local vessels, as Dendang, the capital of the district, is situated on the eastern side of the head of the bay. The bay is encumbered with reefs which dry, some of which are marked by beacons, privately maintained, and it can only be entered by vessels of light draught with local knowledge.

Umpang, a small islet covered with shrubs, with several reefs around, lies in the middle of the entrance and there is a swept channel on either side. These channels join northward of Umpang to form a common channel leading northward to the anchorage between Kampak, an island about 3 miles north-north-eastward of Tanjong Rusah, and Tanjong Rising, on the eastern side of the bay about 4 miles north-eastward of the same point.

A prominent tree stands about 1½ miles north-eastward of Tanjong Rusah. A beacon, with triangular topmark, privately maintained, stands on a drying shoal about half a mile eastward of the eastern extremity of Kampak. The small, but high, islet of Berumput lies

Chart 2160.

about 6¾ miles north-westward of Tanjong Kelumpang and about 2¼ miles offshore. Pudak hillock is situated about 5½ miles north-eastward of Berumput.

Vessels with local knowledge can anchor about 1¼ miles south-westward of Dendang, between Kampak and Tanjong Rising, in a depth of about 2½ fathoms ($4^{m}6$). With strong southerly winds the water at the head of the bay sometimes rises fully one foot ($0^{m}3$) above the usual level.

Directions.—Vessels from westward should steer an easterly course so as to pass about one mile southward of Ketupai and enter the swept channel about 3 miles south-eastward of Kramiah ; thence the summit of Berumput should be kept in line with Pudak hillock, bearing 048½°, until the prominent tree north-eastward of Tanjong Rusah (*Lat. 3° 10′ S., Long. 107° 51′ E.*) bears 330°, when a northerly course should be steered for the beacon eastward of Kampak. When the southern point of Kampak bears 317° the vessel should steer for the anchorage between Kampak and Tanjong Rising. Depths in the swept channel decrease from about 9 to 2 fathoms ($16^{m}5$ to $3^{m}7$).

Vessels from eastward should steer a westerly course so as to pass about 3 miles southward of Tanjong Kelumpang and thus avoid the reef, with a depth of 5 feet ($1^{m}5$) over it, about 1½ miles south-south-eastward of that point, *see* below. When the prominent tree north-eastward of Tanjong Rusah bears 326° it should be steered for and kept in line with the right-hand shoulder of Bergham, a hill about 10½ miles north-westward of Tanjong Rusah, until Berumput bears 058° when a northerly course should be steered, as given in the directions for approaching from westward.

Off-lying islet.—Ketapang, a low, swampy, wooded islet, lies nearly 8½ miles southward of Tanjong Kelumpang ; there are two above-water rocks on the northern side of the reef which surrounds this islet.

Coast.—Dangers.—The coast between Tanjong Kelumpang and Tanjong Batu Hitam, a low, rocky point about 6 miles east-north-eastward, is low and densely wooded. Some islets and rocks lie on the coastal reef, which extends as much as half a mile and dries. There are some above-water rocks within a distance of one mile south-eastward and 1½ miles east-south-eastward of Tanjong Kelumpang. A reef, with a depth of 5 feet ($1^{m}5$) over it, lies about 1½ miles south-south-eastward of the same point. There is a 3¾-fathom ($6^{m}9$) patch nearly 3 miles south-westward of Tanjong Kelumpang. Busung Lantai, a detached reef which dries, lies about midway between this point and Tanjong Batu Hitam and nearly half a mile offshore. Some small islets or rocks lie close off Tanjong Batu Hitam, and a reef, with a depth of 2 feet ($0^{m}6$) over it, is situated about half a mile south-eastward of this point.

Islet and dangers southward of Billiton.—Kebatu (*Lat. 3° 48′ S., Long. 108° 04′ E.*), about 31 miles southward of Tanjong Kelumpang, is a rocky islet, 341 feet ($103^{m}9$) high, visible from 22 to 24 miles in clear weather, when it appears as a conical hummock. It is covered in places with stunted trees, and is steep-to except at its north-western point, where there is a sandy beach, and a reef, on which are some above-water rocks, extends about 2 cables west-north-westward. The fishermen name the islet Tjina Pebatun, as it bears some

Charts 941a, 1263.

Chart 2160.

resemblance to a seated Chinaman. It is a useful landmark when making for Gaspar straten or Straat Karimata.

Witte rots, 57 feet (17^m4) high, situated nearly one mile south-westward of Kebatu, is of a greyish-white colour and is visible from a distance of 12 miles in clear weather. A reef, with a depth of one foot (0^m3) over it, lies about half a mile north-eastward of Witte rots; under favourable conditions it is marked by a brown discoloration, and by surf when there is any swell. This reef was discovered in 1931, and the existence of further dangers in this locality, hitherto unknown, is possible. Zephyr rif, nearly one mile westward of Kebatu, has some rocks on it which dry.

Grace reefs lie north-north-eastward of Kebatu, with Witte rots just open westward of that islet. The south-western reef is situated about 4 miles north-north-eastward of Kebatu and nearly dries; on the north-eastern reef, Karang Kawat, which lies about 6 miles north-eastward of Kebatu, there are only a few rocks which dry. Both reefs are steep-to, and are usually marked by surf or tide rips at high water; in clear weather in the west monsoon Ludai gebergte, on the southern side of Billiton, is sometimes visible just above the horizon.

EASTERN SIDE OF BILLITON.—Westward of the line drawn from Discovery Oostbank (page 166) to Catharine reef (page 162), which forms the western limit of the main passage through Straat Karimata, or approximately westward of the meridian of 109° E., the eastern side of Billiton is fronted by innumerable islands, islets and reefs. The description of the inshore passage between the reefs, and to Linggang (page 156) and Manggar (page 158), is given hereafter. Vessels should not leave the recommended routes except in cases of necessity, and it must be distinctly understood that local knowledge is essential for safe navigation in these channels.

Pilots.—Good pilots for these waters can be obtained at Tandjung Pandan (page 137); they are exceptionally clever and quick in detecting reefs and dangers, but only under the coast, with which they are well acquainted. They belong to the so-called "Orang Sekeh," the native fishermen of the islands in and near Gaspar straten.

Coast.—Tanjong Batu Bujong, about 2 miles northward of Tanjong Batu Hitam (page 153), is the southern entrance point of a shallow bay greatly encumbered by the coastal reef which extends from its shores. Serukat besar is an islet lying nearly 3 miles east-north-eastward of Tanjong Batu Bujong (*Lat. 3° 12′ S., Long. 108° 06′ E.*) and 3 cables offshore; in the west monsoon there is good anchorage about 1½ miles southward of this islet, in a depth of about 5 fathoms (9^m1), mud, and it can be easily approached from southward.

Tanjong Tapok is situated about 9½ miles north-eastward of Tanjong Batu Hitam, and a chain of islands and reefs extends about 5 miles southward from this point; Tepi and Pandjang are the two southern islands of this chain. Depths of less than 5 fathoms (9^m1) extend about 2 miles south-south-westward from Tepi.

The islet of Sekapar lies about 2 miles eastward of Tanjong Tapok, and there are several reefs, with depths of less than 6 feet (1^m8) over them, up to 2 miles eastward and one mile southward of Sekapar.

The whole of the coast, as far northward as Tanjong Samak, situated about 16 miles north-north-eastward of Tanjong Tapok, is low. The

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Chart 2160.

coastal reef extends as much as 2 miles offshore between Tanjong Tapok and Selandu (page 156), about 4½ miles north-north-eastward. Tiung (page 151), about 10¾ miles west-north-westward of Tanjong Tapok, Slumar, 548 feet (167^{m}0) high, about 7 miles south-westward of Tanjong Samak, and Bolong (Boleng), 1,109 feet (338^{m}0) high, about 9 miles north-north-westward of Slumar, appear as isolated cones.

Off-lying islands and dangers.—Rotan lies about 4 miles eastward of Tepi (*Lat. 3° 14′ S., Long. 108° 12′ E.*), and the channel between is divided into two parts by a shoal, with depths of less than 5 fathoms (9^{m}1), on which are several above-water and sunken rocks; the channel westward of the shoal has been swept and is the recommended inshore route, *see* Directions on page 157. A reef, with a depth of 3 feet (0^{m}9) over it, lies about 2 miles south-south-westward of Rotan; there are numerous reefs within a distance of 2¼ miles south-eastward of this island.

Ajer Masin, the north-western of the Schaarvogel eilanden, lies nearly 6 miles east-south-eastward of Rotan, and has a prominent tree nearly in the middle, which is visible 18 miles in clear weather. The channel between Ajer Masin and Rotan should not be used, as there are some reefs in the middle of the southern entrance and in the northern approaches.

All the Schaarvogel eilanden are low and thickly wooded, and there are numerous reefs and sandbanks around them. Nearly all these reefs are steep-to, and sounding gives no warning; any vessel attempting to navigate between these islands must, therefore, use the utmost caution. The channels on either side of Penerus, the middle island of the group, are serviceable, but the tidal streams are strong and there is little shelter in either monsoon. A shoal, with a depth of 3 feet (0^{m}9) over it, lies about 1½ miles north-north-eastward of the northern extremity of Penerus, and there are depths of less than 2½ fathoms (4^{m}6) for about 2½ miles southward of the same islet. A rock, with a depth of less than 6 feet (1^{m}8) over it, lies about 2 miles westward of the southern extremity of Penerus. The eastern channel, between Penerus and Pengapit, is the wider of the two, and has depths of from 16 to 25 fathoms (29^{m}3 to 45^{m}7) in the fairway, but coral patches and detached rocks lie on either side of the channel, although these are generally marked by surf or discoloration. Pengapit is divided into two parts by a narrow channel, which dries. The western channel, between Penerus and Marai, is narrower, but is deep in the fairway. Beluput, Lung, and Pengapit Lung, the three eastern islands of the group, lie close together; Beluput (*Lat. 3° 20′ S., Long. 108° 28′ E.*) is the highest of these, and can be readily identified from eastward, when it appears as a hump. Several dangers lie southward of Pengapit, the outermost being a rock which dries, situated about 4 miles southward of that island.

Bower rif, about 13 miles south-eastward of Pengapit, is a small, steep-to coral reef with a depth of 1¼ fathoms (2^{m}3), lying nearly in the middle of a narrow ridge of sand, with depths of from 7 to 11 fathoms (12^{m}8 to 20^{m}1), about 13 miles long in a north and south direction; this reef is never marked by discoloration, but there are sometimes eddies over it. Discovery West bank and the other dangers northward and eastward of it are described with Straat Karimata on pages 165-166.

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Chart 2160.

Osterley reefs lie northward of Bower rif and eastward of the Schaarvogel eilanden. Zuidrif, the southernmost of these dangers, is situated about 6½ miles northward of Bower rif, and is a coral reef with a few patches of sand on it just above water. East Osterley, nearly 2 miles north-eastward of Zuidrif, has some rocks on it which dry. North Osterley, about 3 miles northward of East Osterley, nearly dries, and is often marked by breakers and tide rips. A 3¾-fathom ($6^{m}9$) patch lies about 2½ miles westward of North Osterley, and about 2 miles farther westward is a reef with a depth of 5 feet ($1^{m}5$) ; the latter reef can usually be detected by tide rips but with a moderate breeze no surf or discoloration was observed on it. Between the Osterley reefs the diurnal tidal streams run north-westward and from south-south-east to east-south-east ; during the survey there was a very slight current setting north-westward in November, and in December there was a constant monsoon current setting south-south-eastward, only occasionally diminishing in force.

Protet reefs are two steep-to reefs lying about 2½ miles apart in an east-south-easterly and west-north-westerly direction. East Protet reef lies about 14 miles north-north-eastward of Ajer Masin and has a depth of 5 feet ($1^{m}5$) over it ; it is steep-to and generally breaks. West Protet reef has a depth of 1½ fathoms ($2^{m}7$), coral, over it. Strong ripplings have been observed about two miles east-north-eastward of the eastern reef, but no dangers have been discovered, although there are abrupt changes of depths from 12 to 20 fathoms ($21^{m}9$ to $36^{m}6$).

Within the triangular area bounded by the lines joining Rotan, Protet reefs and Bower rif there are numerous dangers in addition to those already described, and the positions of these are best seen on the chart. On the various ridges of sand are scattered rocks and small patches of coral, some of which are just above water. Reliable landmarks can only be seen in clear weather and even then are difficult to identify ; the tidal streams are strong, and the water is usually so troubled that the bottom cannot be seen even at a depth of 2 fathoms ($3^{m}7$). The whole of this area should, therefore, be avoided except in case of necessity.

Rede Linggang.—Islets.—Dangers.—Beacons.—Sungei Linggang flows out about 7 miles northward of Tanjong Tapok (*Lat. 3° 09′ S., Long. 108° 13′ E.*) and is the most important river on the eastern coast of Billiton. Selandu, about 2 miles south-eastward of the mouth of the river, is a low wooded island, with a hillock near its north-eastern extremity, almost connected to the main coastal reef, which dries. Melidang lies about 1¾ miles eastward of Selandu, and is a useful mark for avoiding the dangers northward of the Schaarvogel eilanden ; from eastward this island shows a rugged ridge of hills, the summit of which is near the northern extremity and is visible about 20 miles in clear weather. Ajam besar and Ajam kechil are two islets which lie between Selandu and Melidang ; there are several reefs southward and south-westward of Melidang. The roadstead is northward of Selandu, where there are depths of from 2¼ to 3¼ fathoms ($4^{m}1$ to $5^{m}9$).

The islet of Sukun lies about 2¾ miles north-north-westward of the northern end of Melidang ; it is fringed by a drying reef which extends nearly three-quarters of a mile south-eastward from the islet. A drying reef is situated about 1½ miles north-eastward of the northern

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end of Melidang, and a reef, with a depth of less than 6 feet (1^{m}8) over it, lies about 2 miles north-westward of the same point.

Gantung is an islet about 2 miles northward of Sukun and a foul area, encumbered with drying reefs and other dangers, lies northward of the above dangers and extends up to 3½ miles eastward from Sukun and 4½ miles eastward from Gantung, where the sand cay Busung Djong is situated. A beacon, with square topmark, privately maintained, stands on a reef nearly half a mile south-westward of Gantung. Between Gantung and the coast westward there are several large patches of drying reef, and the small islet Obi lies on one of these reefs about one mile westward of Gantung. There are two patches of drying reef about 1¾ miles west-north-westward of Sukun and another drying reef lies about 2½ miles westward of the same islet.

A detached drying reef is situated about a quarter of a mile off the north-western side of Selandu and 1¾ miles east-south-eastward of the mouth of Sungei Linggang (*Lat. 3° 02′ S., Long. 108° 13′ E.*).

Sungei Linggang has scoured a channel through the coastal bank of sand and coral, which extends about three-quarters of a mile eastward from the southern entrance point of the river, and this channel is marked by beacons privately maintained. There is a least depth of 4 feet (1^{m}2) on the bar, but in the river the depths increase rapidly to 6 feet (1^{m}8) and more. The river is marked by beacons, privately maintained, as far as Gantung, the capital of the district, about 6 miles from the mouth; owing to various sand ridges, however, it is only navigable by small craft with a draught of 6 feet (1^{m}8) after half flood tide. About 1½ miles within the mouth the river bends towards the coast, and is only separated from the sea by a high sandy ridge, covered with vegetation, about a quarter of a cable broad. Just above Gantung the river is closed by a dam and at Gantung the river is spanned by a bridge, which permits only boats to pass underneath.

Directions.—It is not advisable to approach Rede Linggang from eastward, as there are several small coral reefs, difficult to discern, near the Protet reefs, and the area between the latter and the Schaarvogel eilanden is unsafe.

Vessels from southward should use the swept channel between Tepi (page 154) and the group of islets and reefs about one mile eastward. The hills Tiung (page 151) and Slumar (page 151), and the prominent tree on Ajer Masin, are useful landmarks. This channel should be approached with the eastern extremity of Tepi bearing 010°, and when about one mile southward of this island a north-easterly course should be steered to pass 2 miles south-eastward of Sekapar and about half a mile south-eastward of the reef, with a depth of less than 6 feet (1^{m}8) over it, lying nearly 2 miles eastward of Sekapar. Thence this north-easterly course should be held until about 3¼ miles south-eastward of Melidang when that island may be rounded, keeping at a distance of three-quarters of a mile from its north-eastern end and thus passing midway between that island and the drying reef about 1½ miles north-eastward of it. A west-north-westerly course may then be steered for the anchorage about 2 miles eastward of the mouth of Sungei Linggang.

A channel, about three-quarters of a mile wide, has been swept from a position 3½ miles south-eastward of Melidang (*Lat. 3° 04′ S., Long. 108° 18′ E.*) in an 048° direction for 11 miles, passing between West

Chart 2160.

Protet reef and the shoal water about 3 miles north-north-westward, but it is not recommended that this channel should be used in approaching Rede Linggang.

Coast.—Tanjong Samak, about 9½ miles north-north-eastward of the mouth of Sungei Linggang, is rendered prominent by a small hill, 236 feet (71^{m}9) high, near the point. There is a settlement of the Billiton Company on this hill, and the electric lights can be seen from a distance of about 21 miles in the evenings; a white power station, built on the northern slope, is very prominent by day. The oiling pier, about three-quarters of a mile north-eastward of Tanjong Samak, is described below.

Vessels passing along the coast must give Tanjong Samak a berth of 12 miles when south-eastward of it and fully 10 miles elsewhere, as numerous dangers lie within these distances.

Sungei Merang flows out in the small bay immediately southward of Tanjong Samak; there are depths of 10 feet (3^{m}0) about one mile offshore here, and Manggar, the capital of the district, can be easily reached by land.

Rede Manggar. — Buoys. — Beacon. — Anchorages. — Rede Manggar is off the mouths of Sungei Manggar, the southern mouth of which discharges about 2½ miles northward of Tanjong Samak (*Lat. 2° 53′ S., Long. 108° 18′ E.*); its northern mouth lies about 1½ miles further northward.

A beacon, with white ball topmark, marking a 10-foot (3^{m}0) patch, stands nearly 4 miles north-eastward of the northern mouth of Sungei Manggar.

There is anchorage for vessels, with local knowledge, in a depth of 3¼ fathoms (5^{m}9) about three-quarters of a mile off the northern mouth of the river; another anchorage lies eastward of the above beacon, where there are depths of from about 9 to 12 fathoms (16^{m}5 to 21^{m}9).

The roadstead is approached through a buoyed channel, with a least depth of 15 feet (4^{m}6), which runs nearly parallel to the coast and is entered from northward, passing close eastward of the beacon with white ball topmark. The channel is marked by black can buoys on the eastern side and white conical buoys on the western side. The positions of the buoys are liable to change as dredging is continuously in progress.

The southern mouth of the river has been dredged to a depth of 10 feet (3^{m}0), over a width of 200 feet (61^{m}0). In 1952, a harbour was under construction within the southern mouth. Coastal vessels can enter this mouth and proceed up Sungei Manggar to a berth at a quay, 150 feet (45^{m}7) in length, but this should not be undertaken without a local pilot. The river is navigable for cargo praus up to Manggar, situated 3 miles upstream, where a private company has a settlement.

There is a dry dock at Manggar, which can take a vessel about 213 feet (64^{m}9) in length. Provisions can be obtained in small quantities only; fresh water is obtainable, but it should be boiled before drinking. There is a small quay alongside which praus can berth. Five small tugs are available. There is a small hospital with a doctor.

An oiling pier, with a depth, in 1949, of 30 feet (9^{m}1) at its head, extends from the coast about three-quarters of a mile north-eastward of Tanjong Samak (*Lat. 2° 53′ S., Long. 108° 18′ E.*), and there are some mooring buoys off it; vessels cannot lie alongside the pier during the height of the south-east monsoon. Fresh water cannot be obtained

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Chart 2160.

at this pier, nor is bunkering possible. Two tin-dredgers operate close to the buoyed channel leading to this pier.

Pilots.—A pilot is available who will meet vessels in the vicinity of the beacon, with ball topmark, about 4 miles north-eastward of the northern mouth of Sungei Manggar. Requests for this pilot, stating probable time of arrival at the beacon, should be made in good time to "Constanno," Tandjung Pandan. Vessels should not attempt to enter the roadstead, proceed up Sungei Manggar, or berth at the oiling pier without the assistance of this pilot.

Tidal streams.—The tidal stream plus current in the roadstead may attain a rate of 3 knots. From May to September inclusive the north-going stream is the stronger and of longer duration; from October to April the flow is almost always south-going. There may be a strong stream by the oiling pier.

Climatic table.—*See* page 40.

Off-lying islands and dangers.—Buoy.—Numerous coral reefs and sand ridges extend in a south-easterly direction from Rede Manggar to within about 3 miles of the Protet reefs, and the coast for about 4 miles northward of Sungei Manggar is fronted by reefs which lie from one to nearly 4 miles offshore; it is, therefore, extremely dangerous to attempt to reach Rede Manggar from eastward.

Bukulimau, nearly 9 miles north-eastward of Tanjong Samak, is a low island covered with high trees, visible about 15 miles in clear weather. Siadung is a low, thickly wooded islet about one mile north-eastward of Bukulimau; the channel between these two islands is encumbered with reefs, and the tidal streams are strong. There is no safe channel southward of Bukulimau.

Busung Madau, about 3 miles north-westward of Siadung, is a sand cay covered with shrubs and some coconut trees in the middle, and can be seen from a distance of 10 miles in clear weather. A reef, with a depth of 5 feet ($1^{m}5$) over it, lies about 1½ miles north-westward of Busung Madau. It is marked on its northern side by a black can buoy surmounted by a truncated cone.

Directions.—Local knowledge is essential for vessels proceeding to Rede Manggar. The directions given hereafter are merely intended as an indication of the route which was taken, in 1952, by local vessels proceeding from Rede Linggang to Rede Manggar; the utmost caution must be exercised, as in recent years several hitherto uncharted reefs have been discovered off the eastern coast of Billiton.

From the anchorage northward of Selandu an east-south-easterly course may be steered so as to pass northward of Melidang and southward of the drying reef lying about 1½ miles north-eastward of the northern extremity of Melidang (page 156). When nearly 2 miles eastward of the northern extremity of Melidang course may be altered to 030°; continue on this course, giving a good berth to the dangers between the above-mentioned drying reef and Busung Djong, a sand cay, visible 4 miles, lying about 6 miles north-north-eastward of Melidang (*Lat. 3° 04′ S., Long. 108° 18′ E.*), until the northern extremity of Sukun is in line with the northern end of Busung Djong, bearing 238°. Keep this mark on astern, which leads in a least depth of 5 fathoms ($9^{m}1$) between the outer reefs extending south-eastward from Rede Manggar, but passes close north-westward of a 2¾-fathom ($5^{m}0$) patch lying about 4½ miles east-north-eastward of Busung Djong;

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Chart 2160.

attention must be paid to the tidal streams, which set northward and southward across these reefs, sometimes strongly. When the western extremity of Bukulimau bears 342°, course should be altered to 322°, so as to pass westward of a sand cay, covered with shrubs and having three coconut trees in the middle, situated about 2 miles south-south-westward of Bukulimau. When the southern extremity of this island bears 065°, course may be safely steered for the black can buoy marking the 5-foot ($1^{m}5$) patch, about 1½ miles north-westward of Busung Madau (page 159). When abreast the beacon with white ball topmark, the pilot should be awaited and, when embarked, the buoyed channel to Rede Manggar can be entered.

Vessels from northward should steer to pass northward of the black can buoy, surmounted by a truncated cone, marking the 5-foot ($1^{m}5$) patch about 1½ miles north-westward of Busung Madau, and then pass westward of it and steer for the beacon with white ball topmark. This route has not been swept and the possibility of uncharted dangers should be borne in mind.

Coast.—Tanjong Burok, about 4 miles northward of the southern mouth of Sungei Manggar, is a rocky point. Tanjong Burung Mandi (*Lat. 2° 45′ S., Long. 108° 17′ E.*), about 2 miles northward of Tanjong Burok and the north-eastern extremity of Billiton, is a high rocky point; it is rendered prominent by Menang, a hill just within the point, which appears flat when seen from northward, and is considerably lower than Burung Mandi, a prominent twin peak, 1,407 feet ($428^{m}8$) high, nearly 2 miles westward. *See* view facing this page.

Momparang eilanden.—The Momparang eilanden lie north-eastward of Tanjong Burung Mandi, and consist of a number of small islands, sandbanks and coral reefs which cover an area of about 30 miles in an easterly and westerly direction; large rocks lie on many of the reefs surrounding the islands. They are all uninhabited, but are frequented by fishermen from the neighbouring coast of Billiton, who seek turtles' eggs on the sandbanks and hunt the sea-calf which frequent these waters. Only the principal islands and reefs are described hereafter, and the position of the remainder are best seen on the chart.

Mempirak, the southernmost island of the group, is situated about 10 miles east-north-eastward of Tanjong Burung Mandi; it is thickly wooded and has some very high trees, which show plainly above the remainder. A reef, with a depth of less than 6 feet ($1^{m}8$) over it, lies about 2 miles south-westward of Mempirak, with some reefs, which dry and are generally marked by surf, between. There is a reef, with a least depth of 3 feet ($0^{m}9$) over it, about 3 miles east-south-eastward of Mempirak. Bakau, about 1¼ miles north-westward of Mempirak, is low and flat; some above-water and sunken rocks and a drying sandbank lie within one mile north-eastward of Bakau. Except for these reefs the channel between Mempirak and Siadung (Sadoeng) is clear and deep, and can be used by vessels bound for Buding baai (page 163) from south-eastward.

Siadung, about 4 miles eastward of Bakau, is low and covered with vegetation; a 2¾-fathom ($5^{m}0$) patch lies about 2¼ miles north-westward of Siadung. Maranai, about 2½ miles northward of Siadung, is thickly wooded and somewhat hilly; it is visible about 14 miles in clear weather and can be readily distinguished from the other islands by its peculiar round shape. Gosong Baru, nearly one mile eastward

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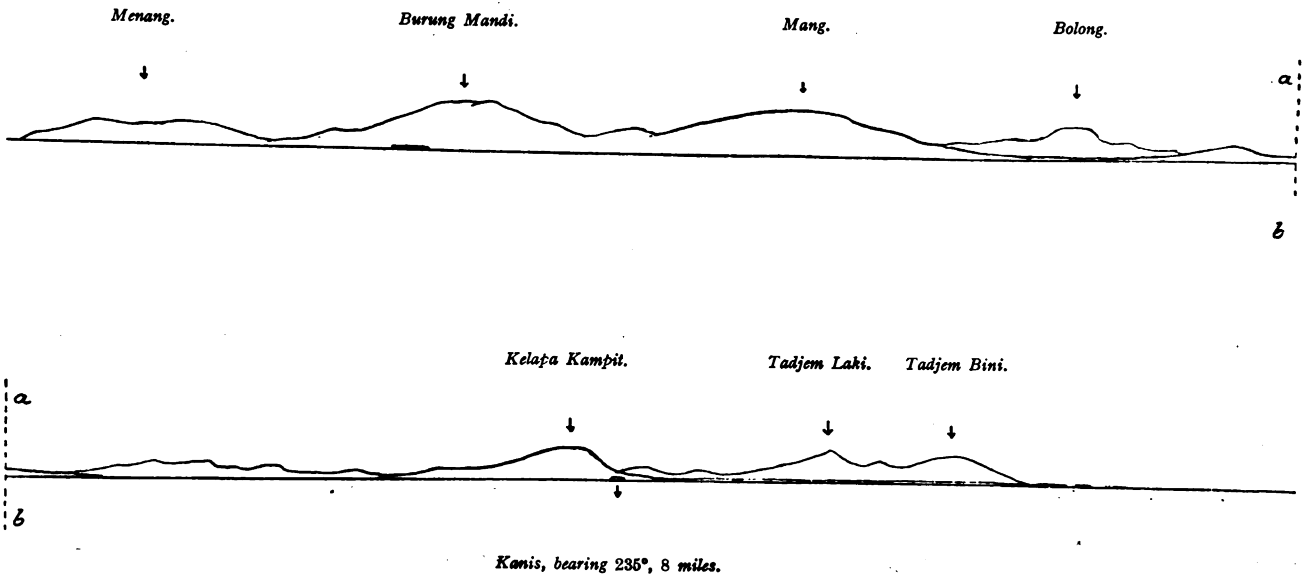
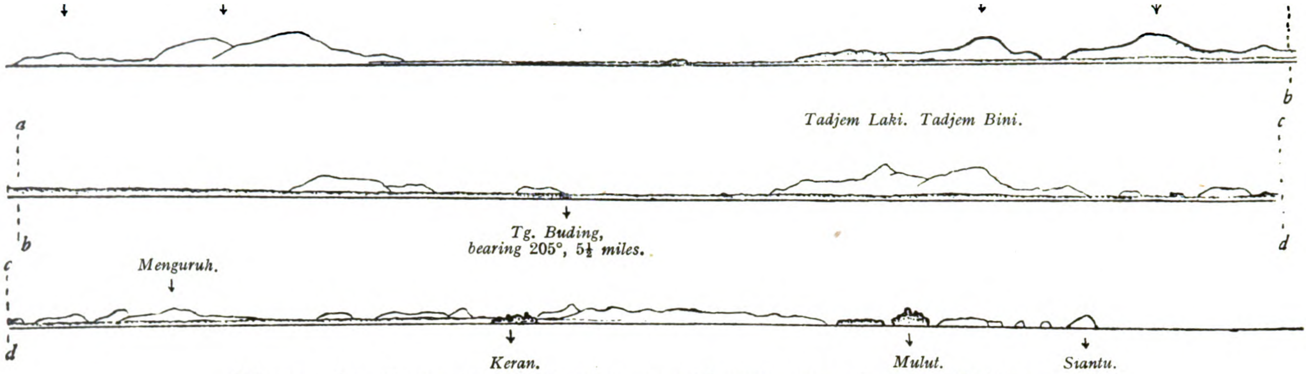
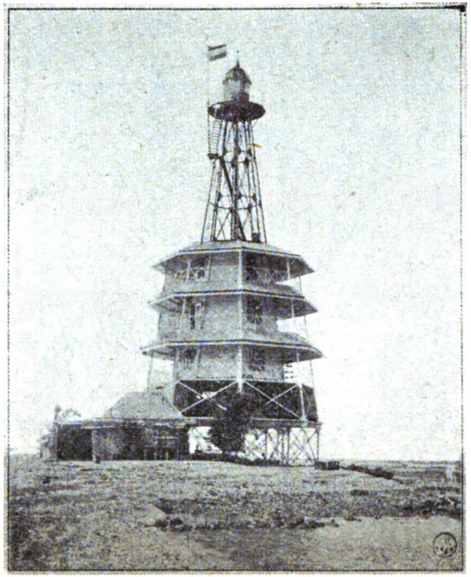


View, in 2 parts, of the north-eastern part of Billiton.

(*Original dated* 1949.)



View, in 3 parts, of the northern coast of Billiton.
(*Original dated* 1929.)



Discovery Oostbank lighthouse.
(*Original dated* 1903.)

of Maranai, is a sandy cay with a few trees on it. The area around and between Siadung and Maranai is foul; and should be avoided.

Hydrograaf, about 4½ miles north-westward of Maranai, has a depth of 2 fathoms (3^{m}7) over it and is not marked in any way; a 2¾-fathom (5^{m}0) patch and a 4¼-fathom (7^{m}8) patch lie, respectively, about 2¼ and 4½ miles east-north-eastward of Hydrograaf (*Lat. 2° 35′ S., Long. 108° 26′ E.*). Busung Serlang and the other reefs westward of Maranai are described on page 163.

Telagapahat, about 5 miles north-eastward of Maranai, is low, except for two rocky hillocks on the southern extremity; fishermen visit this island for water. Njamuk and Sekumpul, off the northern side of Telagapahat, are low. These three islands are thickly wooded; the channels between them are foul. A reef, with a depth of 3 feet (0^{m}9) over it, lies 2 miles westward of Telagapahat. Foul ground, with some above-water reefs and sand cays, lies from 1¼ to 3 miles eastward and from 1¼ to 5 miles south-eastward of the same island.

Nangka, about 2¼ miles north-north-westward of Sekumpul, is the only high island of the group, and rises in two peaks on the northern and southern sides of the island, respectively; the southern peak, 590 feet (179^{m}8) high, is the higher and steeper of the two, and is visible 32 miles in clear weather. From a distance, when seen from eastward or westward, Nangka appears as two high islets. Sembilan is a small islet about half a mile westward of the southern point of Nangka. A 3¾-fathom (6^{m}9) patch and Corcyra, a reef with a least depth of 1¼ fathoms (2^{m}3) over it, lie about half a mile and about 3 miles, respectively, westward of Sembilan, and there is a reef, with a depth of 5 feet (1^{m}5), about 1¼ miles southward of this islet. Corcyra is not marked by surf or discoloration.

Warren reef, about 5½ miles eastward of Sekumpul, is a sandbank 5 feet (1^{m}5) high; a 1¼-fathom (2^{m}3) patch lies about 2 miles west-south-westward, and a drying patch about one mile southward of Warren reef. Karangraja is situated about 5 miles south-eastward of Warren reef, and is low and flat; Berisi is a small islet about half a mile westward of its northern extremity. A 2-fathom (3^{m}7) patch lies about 2 miles south-south-westward of Berisi. Belian, about 2 miles east-north-eastward of Karangraja, is 164 feet (50^{m}0) high and is covered with high trees visible about 16 miles in clear weather. Tempuling is a small islet about midway between Belian and Karangraja. Reefs extend nearly 3 miles north-north-westward from Belian, terminating in Gubbins reef, which has a sandbank on it 6 feet (1^{m}8) high; a similar reef lies about 1½ miles east-north-eastward of Gubbins reef (*Lat. 2° 32′ S., Long. 108° 45′ E.*). Dangerous sunken reefs are situated about 3 miles north-north-eastward and 2½ miles north-eastward of Gubbins reef. A shoal, with a depth of 5 feet (1^{m}5) over its western end, and less than 3 fathoms (5^{m}5) over the remaining part, lies about midway between Gubbins reef and Warren reef. The whole of the area between Gubbins reef and Telagapahat is encumbered with reefs, and it is possible that other dangers, besides those shown on the chart, may exist.

Pesemut, the easternmost of the Momparang eilanden, lies about 6 miles north-eastward of Belian, and is a sand cay with trees on it 127 feet (38^{m}7) high. Tuan is a small islet about 1¾ miles south-south-westward of Pesemut. Justina, about 1½ miles eastward of

Chart 2160.

Pesemut, is a sandbank awash. The area between Pesemut, Tuan and Justina is foul. Whittingham reef, with a depth of 2 fathoms (3^{m}7), lies about 1½ miles northward of Justina, and Catharine reef, with a depth of 5 feet (1^{m}5), is about 3 miles eastward of Justina; these two reefs are not marked by surf or discoloration.

Condor reef (*Lat. 2° 25′ S., Long. 108° 41′ E.*), the northernmost danger of the Momparang eilanden, lies about 10½ miles west-north-westward of Pesemut, and consists of two small patches of coral with a depth of 2½ fathoms (4^{m}6) over them; this reef is not marked by discoloration, but there are frequently tide rips. Flying Fish reef, and the other dangers northward of the Momparang eilanden, are described on pages 166-167.

Directions.—Although generally the passages between the islands and reefs of the Momparang eilanden are very dangerous for large vessels, small vessels in case of necessity can make use of a few of these passages. The best channel is between Maranai and Telaga-pahat. From southward steer midway between these two islands on a course 302°, care being taken to avoid the 4¼-fathom (7^{m}8) patch about 4½ miles east-north-eastward of Hydrograaf, and when past this patch steer slightly more northward, so as to pass between the 2¾-fathom (5^{m}0) patch, lying about 2¼ miles east-north-eastward of Hydrograaf, and Corcyra.

Vessels bound for the northern coast of Billiton, from northward of Pesemut, should keep the southern peak of Nangka bearing between 248° and 258°, and, when past Condor reef and approaching Nangka, steer to pass at not less than one mile northward of the latter.

NORTHERN SIDE OF BILLITON.—The northern side of Billiton is generally high, and there are many useful peaks for fixing a vessel's position in clear weather. Kelapa Kampit, about 12 miles west-north-westward of Tanjong Burung Mandi and 5 miles inland, is a prominent conical hill, 686 feet (209^{m}1) high, the western side of which appears rugged when seen from northward. The Tadjem gebergte, nearly in the middle of Billiton, have been described on page 129. Sekaju, 532 feet (162^{m}2) high, about 16 miles west-north-westward of Kelapa Kampit and 2½ miles inland, has a crater-shaped summit and a prominent patch of red rock on the eastern slope; its western slope is rugged. *See* view facing page 160.

The entire coast is fringed by coral reefs, sandbanks and rocks. Farther seaward, up to a distance of 11½ miles offshore, are some small, isolated coral reefs, which are very dangerous to shipping; these dangers are steep-to and are not marked by discoloration. It is possible that a few undiscovered dangers may exist. The usual route to and from Straat Karimata leads northward of Florence Adelaide reef (page 167), so that Billiton is not sighted.

Coast.—Off-lying islet and dangers.—Light.—The coast between Tanjong Burung Mandi and Tanjong Buding, nearly 17 miles north-westward, is fringed by a coral reef, which extends as much as one mile near the latter point, and there are many dangers outside it. Telok Pering is a small bay about midway between these two points, and is entered between Tanjong Kluang and Tanjong Sengaran; the greater part of this bay dries, and Sungei Pasiran and Sungei Pering discharge into it. *See* views facing pages **160, 161.**

Charts 941a, 1263.

Chart 2160.

Karang Tri, awash, lies about 2½ miles northward of Tanjong Burung Mandi. Kanis (*Lat. 2° 37′ S., Long. 108° 13′ E.*), about 3½ miles north-eastward of Tanjong Kluang, is a low islet from which a reef extends about one mile east-south-eastward and west-north-westward; it is a useful mark for fixing a vessel's position. There are several reefs between Kanis and Karang Tri; the outermost of these, with a depth of less than 6 feet (1^m8) over it, lies about 3½ miles east-south-eastward of Kanis and 4½ miles offshore.

A light is exhibited, at an elevation of 50 feet (15^m2), from a white iron structure, 44 feet (13^m4) in height, on Kanis.

Busung Serlang, about 7 miles east-north-eastward of Kanis, has a yellowish-brown sandbank above water on its north-western part, usually visible from a distance of 4 miles; a reef, with a depth of one fathom (1^m8), lies about 3½ miles south-eastward of Busung Serlang, with two other reefs between.

A very dangerous reef, with a depth of 3 feet (0^m9) over it, is situated about 8 miles north-north-eastward of Kanis; from the vicinity of this reef Kanis appears as a small, dark hump against the low coast.

A 2½-fathom (4^m6) patch lies about 4 miles north-westward of Kanis, and about 3½ miles farther north-westward is a rock with a depth of 3 feet (0^m9) over it. A 5-fathom (9^m1) patch and a rock, with a depth of 2 fathoms (3^m7) over it, lie about 2¾ miles and 9 miles, respectively, north-north-westward of Kanis.

Buding baai.—Buding baai, entered between Tanjong Buding and Tanjong Krupit, about 2 miles west-north-westward, is of some local importance, as Buding, which is situated about 4 miles up Sungei Buding, which discharges into the head of the bay, is the capital of the district where an official of the tin mines resides; there is a depth of barely 2 feet (0^m6) off the entrance to the river.

Numerous reefs lie off the entrance to the bay, and it can only be entered by small vessels with local knowledge; the outermost reef, with a depth of 1½ fathoms (2^m7) over it, is nearly 4 miles northward of Tanjong Buding. Keran, about 4¼ miles north-westward of Tanjong Buding and one mile offshore, is a rocky islet, 164 feet (50^m0) high, with some trees on it standing well apart from each other. There is a narrow passage, marked by beacons privately maintained, passing about three-quarters of a mile eastward and half a mile northward of Tanjong Krupit (*Lat. 2° 35′ S., Long. 108° 01′ E.*), thence southward of Keran to Bulu, *see* page 164, which is much used by fishermen and praus of the Billiton ferry service. Vessels with local knowledge from south-eastward pass through the passage between Mempirak and Siadung (Sadoeng), *see* page 160, northward of Kanis, and then through the channel along Tanjong Buding.

There is good anchorage, for vessels with local knowledge, in the entrance to Buding baai, with the eastern extremity of Keran in line with Tanjong Krupit, bearing about 330°, in a depth of 3½ fathoms (6^m4), mud.

Coast.—Off-lying dangers.—Between Tanjong Krupit and Tanjong Siantu, about 12 miles west-north-westward, a low ridge of hills runs close to the coast. Parallel to the coast, and separated from it by a narrow channel, in which are several rocks, is a chain of islets, reefs and rocks, the easternmost islet of which is Keran.

Mulut, about 4½ miles westward of Keran, is a rocky islet, 217 feet

Charts 941a, 1263.

Chart 2160.

(66^{m}1) high, and appears from seaward as a round hillock, with two prominent sloping trees rising above the surrounding verdure. Anak Mulut, a small islet, lies close eastward of Mulut. Bulu, 158 feet (48^{m}1) high, and Babi, 128 feet (39^{m}0) high, the latter lying on the coastal reef which extends from Tanjong Arabulan, the eastern extremity of the peninsula which terminates north-westward in Tanjong Siantu, are rocky islets covered with vegetation ; the northern side of these two islets must not be approached within one mile. *See* view facing page 161. The western approach to the inner channel, southward of Keran, lies about one mile eastward of Bulu.

A ridge of rocks and reefs, which dries in places, covers a distance of about 3½ miles in an east and west direction about 1½ miles northward of Mulut, and there is a deep channel between. A 2¼-fathom (4^{m}1) patch lies about 4 miles north-eastward of Mulut, and there is a reef which dries about the same distance northward of that islet ; about midway between this reef and Tanjong Siantu are two reefs with depths of 3¼ and 4¼ fathoms (5^{m}9 and 7^{m}8) over them, respectively.

Tanjong Siantu can be easily identified by the conical hill Siantu, 167 feet (50^{m}9) high, situated near the point, and by Siantu (*Lat. 2° 31′ S., Long. 107° 49′ E.*), an islet, 95 feet (29^{m}0) high, close north-westward of the point. A reef, with a depth of 1¾ fathoms (3^{m}2), lies about 2½ miles north-north-eastward of Tanjong Siantu.

The coast between Tanjong Siantu and Tanjong Kelajang, the north-western extremity of Billiton, is fronted by reefs and above-water rocks and should be given a berth of fully 4 miles. The outermost danger, a reef with a depth of 3 fathoms (5^{m}5) over it, lies about 4 miles west-north-westward of Tanjong Siantu and about 3½ miles offshore ; there is a 2¾-fathom (5^{m}0) patch about 1¾ miles north-westward of the same point. Depths of less than 2 fathoms (3^{m}7) extend up to 3¾ miles north-north-eastward from Tanjong Kelajang.

Kampong Sidjuk, the capital of the district, is situated on the coast about 3½ miles west-south-westward of Tanjong Siantu. Tanjong Pinggi, about 6 miles west-south-westward of Tanjong Siantu, has a hillock on it ; there are numerous rocks off Tanjong Pinggi, and Witte rots, one of the highest, situated nearly 2 miles west-north-westward of the point, is in the form of a sugar loaf, with a bright white summit.

STRAAT KARIMATA.—Straat Karimata (Carimata) is the passage between Billiton and the Momparang eilanden on the western side, and Karimata and the Borneo coast on the eastern side ; it is the customary route taken by vessels bound for the Straits Settlements or China from the eastern part of the Java sea. Such vessels pass well outside all the dangers lying off the eastern side of Billiton which have been described in the beginning of this chapter, and practically never sight either Billiton or the Borneo coast ; the direct route to Pontianak from the Java sea is eastward of Karimata

The main route lies eastward of Discovery Oostbank (*Lat. 3° 35′ S., Long. 109° 11′ E.*) and Cirencester shoal. The lines joining Discovery Oostbank, a point 20 miles eastward of Cirencester shoal, Catharine reef, and Ontario reef must be considered as the western limit of safe navigation for large vessels passing through Straat Karimata ; it is possible that uncharted dangers may exist westward of the above limit.

With regard to reported shoals, Lieut. Hoskyn, commanding H.M.

Charts 941a, 1263.

surveying vessel *Flying Fish*, remarks that on three different occasions, in 1880, whilst at work in the neighbourhood of the Greig and Gwalia reefs, large floating masses of vegetable matter and other debris were encountered. One of these was so large that it could be seen from the bridge at a distance of 7 or 8 miles, and so dense that at a moderate distance it might readily have been mistaken in daylight for a rock. Another bore a striking resemblance to a small sandbank with a bush on it, and was visible from 5 to 6 miles.

Currents and tidal streams.—The horizontal movement of the water in Straat Karimata is mostly the monsoon current, *see* page 9. The tidal streams are diurnal, but their influence is only felt under the coasts of Billiton and Borneo; they are, therefore, of little importance to large vessels passing through the strait.

In the open part of the strait the mean rate of the current is half a knot in the south-east monsoon, and nearly one knot in the north-west monsoon; it is, however, subject to considerable variations, which cannot be predicted, so that a maximum rate of nearly 2 knots has been observed in the south-east monsoon, whilst no more than 1½ knots was observed in the north-west monsoon. As the direction of the current depends on the direction of the predominating wind, it practically follows the direction of the channel.

When H.M.S. *Leith* was passing through the strait on 9th October, 1934, a current was observed to be setting south-eastward, at a rate of three-quarters of a knot, during a period of 12 hours when proceeding from Serutu to southward of Tanjong Sambar (*Lat. 3° 00′ S., Long. 110° 18′ E.*). The weather at the time was variable, with alternate calms and heavy southerly squalls; in the Java sea the south-east monsoon was still blowing steadily, with a clear sky and moderate visibility, causing a current of half a knot north-westward until about 30 miles northward of Java.

Only during the change of seasons need any attention be paid to the tidal streams, and even then they are not strong in the open parts of the strait; the following is an indication of their direction:—

Between Discovery Oostbank and Tanjong Sambar: north-west to west-north-west and south-east.

Between Momparang eilanden and Karimata eilanden: north-west and south-east.

Westward of Serutu: west and east.

Westward of Greig reefs: south-west and north-east.

When lying at anchor near the Karimata eilanden during the survey, a sharply-defined line of current rips, stretching as far as the eye could see, was frequently observed; this line shifted slowly northward or southward, thus across the direction of the tidal streams. With rising water there appeared to be two tidal streams here, one setting northward and the other southward, which curved westward after meeting; the water was different in colour on either side of the rips. It is presumed that this boundary disappears when the monsoon current becomes strong.

Dangers on the western side of Straat Karimata.—Light.—Buoy.—Discovery West bank (*Lat. 3° 39′ S., Long. 108° 45′ E.*), about 13½ miles south-eastward of Bower rif (page 155) and nearly 48 miles east-south-eastward of Tanjong Batu Hitam, the south-eastern extremity of Billiton, is a narrow reef with a few above-water rocks on it;

Chart 2160.

a narrow ridge, about half a mile in length, dries. This reef is always marked by discoloration, and always breaks, even at high water. The tidal streams set northward and southward in the immediate vicinity.

Discovery reefs, about 5½ miles north-eastward of Discovery West bank, are steep-to coral reefs with a few above-water rocks on them; at low water they dry over a length of about 3 cables. They usually break heavily, and the surf can be seen from a considerable distance.

Charts 3757, 2160.

Discovery Oostbank, known locally as Gosong Mampango, nearly 21 miles eastward of Discovery reefs, is a steep-to coral reef with a patch of sand, about 6 feet ($1^{m}8$) high, in the middle. The tidal stream sets south-eastward and north-westward in the vicinity of this reef.

A light is exhibited, at an elevation of 82 feet ($25^{m}0$), from a white octagonal framework tower on a white building on white piles, 79 feet ($24^{m}1$) in height, situated on Discovery Oostbank. The light is obscured between the bearings 052° and 135°. *See* view facing page 161.

Chart 2160.

Lavender bank, known locally as Karang Djuruk, about 15 miles north-westward of Discovery Oostbank, is a large reef with a number of black boulders on it which uncover at half-tide; it is plainly marked by discoloration. The tidal streams in the immediate vicinity set south-south-eastward and north-north-westward.

Cirencester bank, known locally as Karang Batuan, about 8½ miles northward of Lavender bank, is a coral reef with a large black boulder and a small brownish-yellow coral patch on it which dry; the boulder only covers at high water spring tides.

Cirencester shoal, nearly 22 miles northward of Cirencester bank, is a small reef with a least depth of 2 fathoms ($3^{m}7$); it is never marked by surf or discoloration, but there are frequently tide rips. A small sandbank, with a depth of 4¾ fathoms ($8^{m}7$) over it, lies about 1¼ miles south-south-westward of Cirencester shoal. From near this shoal the southern peak of Nangka, in the Momparang eilanden, is sometimes visible, and also Burung Mandi on the north-eastern extremity of Billiton; the usual route, however, leads too far eastward of this danger to sight these landmarks.

Broken water over an area about 1¼ cables long in a northerly and southerly direction, and about one cable wide, possibly indicating a shoal, was reported, in 1938, about 5¾ miles east-south-eastward of Cirencester shoal.

A shoal, with a depth of 1¾ fathoms ($3^{m}2$) over it, and a rock, with a depth of less than 6 feet ($1^{m}8$) over it, the positions of which are approximate, were reported, in 1949, about 10½ miles east-south-eastward and 8 miles south-eastward, respectively, of Cirencester shoal.

Charts 3757, 2160.

A shoal, with a depth of 2¾ fathoms ($5^{m}0$) over it, the position of which is also approximate, was reported, in 1949, about 15 miles east-south-eastward of Cirencester shoal; this shoal is marked on its eastern side by a red conical buoy surmounted by a ball.

Chart 2160.

Catharine reef, the easternmost danger of the Momparang eilanden, has been described on page 162.

Flying Fish reef, about 16½ miles north-north-eastward of Nangka, consists of a number of coral patches lying close together; there is

Chart 2160.

a depth of 2¾ fathoms ($5^{m}0$) on one of the south-eastern patches, and from 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$) over the remainder. The water here is so clear, that the dark rocks can be seen in depths of 10 fathoms ($18^{m}3$), but the reefs are never marked by surf or discoloration. In clear weather Burung Mandi and Nangka, as well as the highest peaks of the Karimata eilanden, are visible from near the reefs, but they lie just outside the arc of visibility of Serutu light (page 168).

Chart 3758.

Ontario reef (*Lat. 1° 59′ S., Long. 108° 39′ E.*), nearly 14 miles northward of Flying Fish reef, is a coral reef with a small patch of yellowish-brown coral sand on it which dries; when covered it is generally discernible, at a short distance only, as a light-green patch. A coral patch, with a depth of 5 fathoms ($9^{m}1$) over it, lies about half a mile north-north-eastward of the reef. Ontario reef can be avoided by bearings of the Karimata eilanden by day, and Serutu light at night; the usual route is well north-eastward of the reef.

Chart 2160.

Florence Adelaide reef, about 35 miles westward of Ontario reef, is a steep-to coral reef with a depth of 1¾ fathoms ($3^{m}2$) over it, not marked by breakers or discoloration; it lies in a very dangerous position, out of sight of land or lights, and sounding gives no warning.

The line joining Ontario and Florence Adelaide reefs must be considered the southern limit of safe navigation for large vessels in the northern approach to Straat Karimata.

Charts 3757, 1964.

Dangers on the eastern side of Straat Karimata.—Buoy.— The area for about 40 miles southward of Tanjong Sambar (*Lat. 3° 00′ S., Long. 110° 18′ E.*), *see* page 170, embracing Fox and Clemencia banks, is encumbered with ridges of sand, marked by overfalls and is not navigable. Vessels should pass well southward of these dangers, out of sight of land, and those approaching from northward should allow for the strong easterly set across these banks, augmented by the north-west monsoon current in that season.

Fox banks, the southernmost of these dangers, never break but there are always strong ripplings over them, and with a moderate gale there is a turbulent sea. Fox shoal, the shoalest part of them, lies at the north-western end and 32 miles south-south-westward of Tanjong Sambar, and has a least depth of 2 fathoms ($3^{m}7$) over it; there is a 2¾-fathom ($5^{m}0$) patch off the south-eastern end of Fox banks, about 12 miles south-eastward of Fox shoal. The outer danger is a 6-fathom ($11^{m}0$) shoal about 2¾ miles south-westward of the 2¾-fathom ($5^{m}0$) patch. Two 7-fathom ($12^{m}8$) patches lie about 9½ miles south-westward and 16 miles westward of Fox shoal; the position of the former is approximate.

Clemencia bank, about 26 miles south-south-westward of Tanjong Sambar, is a ridge of hard sand, with a least depth of about one foot ($0^{m}3$) over it; it is steep-to and nearly always marked by surf.

A red conical buoy, surmounted by a cylinder, is moored about 7½ miles north-westward of the shoalest part of Clemencia bank.

Aruba banks, between Clemencia and Fox banks, consist of two narrow banks with a least depth of 2 fathoms ($3^{m}7$) over them; they are generally marked by ripplings.

Tanjong Sambar and the western coast of Borneo are described on page 170.

Charts 2160, 941a, 1263.

Chart 3758.

Karimata eilanden. — Light. — Anchorages. — The Karimata eilanden lie on the eastern side of the northern part of the main route through Straat Karimata, and consist of the large islands Serutu and Karimata, as well as a number of islets and reefs. *See* views facing page 170.

Serutu, the south-western island of the group, is mountainous and has steep rocky coasts; the highest peak, 1,572 feet (479^{m}1) high, is in the middle of the island and can sometimes be seen from a distance of 32 miles. The coasts are practically clear, but the small bays and inlets are foul; the north-western extremity is a rocky peninsula which appears as an islet when seen from westward. A shoal, with a depth of 5 fathoms (9^{m}1), sand and stones, over it, lies about 1¾ miles south-eastward of the eastern extremity of Serutu. Under the northern coast heavy squalls come off from the land during the south-east monsoon. The island is uninhabited except for the light-house keepers.

A light is exhibited, at an elevation of 574 feet (175^{m}0), from a white iron framework structure, 82 feet (25^{m}0) in height, situated on a hill nearly one mile eastward of the western extremity of Serutu (*Lat. 1° 43′ S., Long. 108° 41′ E.*).

Karimata, the largest island of the group, is separated from Serutu by a deep, navigable passage; the eastern side of this passage is formed by a ridge of sand, on which are some rocks with a least depth of 3 feet (0^{m}9), which extends about 5 miles southward from Tanjong Dungu (Doeng), the south-western extremity of Karimata, and this ridge is generally marked by light-green discoloration. Tjabang, 3,375 feet (1,028^{m}7) high, the summit of Karimata, is situated nearly in the centre, and is a rugged peak frequently enveloped in clouds, but in clear weather it can sometimes be distinguished from a distance of 48 miles. The only village on the island is situated at the mouth of a stream on the south-eastern coast, and is inhabited by a few Malays and some Chinese woodcutters. The southern coast of Karimata between Tanjong Dungu (Doeng) and Tanjong Serunai, the eastern extremity of the island, about 9 miles east-north-eastward, is bordered by shoal water and reefs which extend from 2 to 3 miles offshore. Two drying reefs lie about 5½ and 4¾ miles southward of Tanjong Serunai. Foul ground extends for nearly 6 miles south-eastward from Tanjong Serunai and the islet of Besi (page 181) lies near its outer end; the dangers eastward of Tanjong Serunai are described on page 181. For about 3 miles north-westward of Tanjong Serunai foul ground, with some drying reefs, extends up to 1¼ miles offshore.

During the north-west monsoon there is anchorage eastward of the sand ridge which extends southward from Tanjong Dungu, in depths of from 6 to 8 fathoms (11^{m}0 to 14^{m}6), about 2 miles offshore. In the south-east monsoon there is good anchorage westward of Tanjong Senna, the northern extremity of Karimata, in depths of from 11 to 14 fathoms (20^{m}1 to 25^{m}6), mud; the bay on the western side of this point is foul, and must not be entered farther than the alignment of the southern extremity of Buan with Tanjong Senna, bearing about 079°.

Several islets lie off the north-western extremity of Karimata. Begunung (*Lat. 1° 35′ S., Long. 108° 46′ E.*), the highest of these, is 1,290 feet (393^{m}2) high, and is situated about half a mile westward of this point; it can easily be distinguished owing to its sharp conical

Charts 2160, 941a, 1263.

Chart 3758.

summit, which is visible from a distance of 32 miles in clear weather. Surung Gading, 784 feet (239^{m}0) high, lies about 1½ miles westward of Begunung; Genting, 184 feet (56^{m}1) high, is about half a mile west-south-westward of Begunung; Blian, 102 feet (31^{m}1) high, and Busung, 243 feet (74^{m}1) high, are, respectively, about 2 miles southward and 1¾ miles south-south-eastward of Begunung; and Penangis, 66 feet (20^{m}1) high, Bulu, 391 feet (119^{m}2) high, and Kepajang lie, respectively, about 2 miles north-north-westward, 1¾ miles northward and 1¼ miles north-eastward of Begunung. The islet of Lintang is about 6 cables south-eastward of Bulu. Vessels should not attempt to pass between any of these islets, as the adjacent reefs are steep-to and there is usually a strong current.

The islets and reefs eastward of Karimata are described on page 181. Jamsetjie reef and the Leman eilanden, northward of Karimata, are described on page 181.

Charts 3721, 3758.

Dangers in the northern approach to Straat Karimata.—Gwalia, a coral reef with a depth of 3 feet (0^{m}9) over it, lies about 33 miles north-westward of Tanjong Senna, and is the southernmost of a group of reefs which cover a distance of about 14 miles in a north and south direction; these dangers are seldom marked by surf or discoloration, and should be given a wide berth. Erikson, a reef with a depth of 4 fathoms (7^{m}3), and Twilight, with a depth of 1½ fathoms (2^{m}7), are situated about 2½ miles north-westward and 5 miles north-eastward, respectively, of Gwalia (*Lat. 1° 06′ S., Long. 108° 34′ E.*). China reef, with a depth of 4 feet (1^{m}2), lies about 6 miles northward of Erikson. South Greig, Middle Greig, and North Greig reefs, the northern of these dangers, which lie, respectively, about 2½ and 3¾ miles northward and 5½ miles north-north-eastward of China reef, have depths of 5, 2, and 4 fathoms (9^{m}1, 3^{m}7, and 7^{m}3) over them, respectively.

In 1918 a vessel reported having struck a submerged object about 7½ miles westward of South Greig reef. A steep-to reef (chart 2160), with a depth of 2¾ fathoms (5^{m}0) over it, lies about 27 miles north-westward of North Greig reef; it is not marked in any way, and sounding gives no indication of its position.

Chart 2160.

Directions for Straat Karimata.—Vessels making for Straat Karimata from West Java should steer for Discovery Oostbank light-structure, passing eastward of it; when the light-structure bears south-south-westward it should be brought astern and thence an 028° course should be made good for a distance of 52 miles from the light-structure, passing nearly 32 miles south-eastward of Cirencester shoal. The dangers south-eastward and eastward of Cirencester shoal are described on page 166. Course should then be altered north-westward so as to pass nearly 20 miles north-eastward of Catherine reef and between Ontario reef and Serutu, steering so as to pass Serutu lighthouse at a distance of about 5 miles.

Vessels proceeding northward to the China sea, after passing between Ontario reef and Serutu, usually keep approximately on the meridian of 108° E., taking care to avoid the reef, with a depth of 2¾ fathoms (5^{m}0), lying about 27 miles north-westward of North Greig reef, and then pass eastward of Pengiki besar (chart 2660a).

Charts 2160, 941a, 1263.

Chart 2160.

Vessels making for Straat Karimata from East Java make for the eastern side of the southern entrance to the strait, passing westward of Fox banks, Aruba bank, and Clemencia bank; when the buoy marking Clemencia bank (page 167) bears 140° it should be brought astern and a north-westerly course should be steered so as to pass between Ontario reef and Serutu, as described above.

The inshore routes between Karimata and the western coast of Borneo, used by vessels proceeding to Pontianak or other places on this coast, are described on pages 177-180.

Caution.—Fishermen with acetylene lamps frequent the southern approach to Straat Karimata.

Charts 3757, 3758, 3721.

WESTERN SIDE OF BORNEO.—The western coast of Borneo from Tanjong Sambar (*Lat. 3° 00′ S., Long. 110° 18′ E.*) to Tanjong Beras Basah, about 75 miles north-north-westward, is mostly low and marshy; the rivers which discharge through it have banks of sand and mud at their mouths, so that even light-draught vessels can scarcely enter most of them except at high water. The coast is sparsely populated, and Ketapang is the only place of any importance.

Currents and tidal streams.—The horizontal movement of the water on and westward of the line joining Clemencia bank and Maja, an island about 130 miles northward, is the monsoon current, influenced comparatively slightly by the tidal streams. Eastward of this line the diurnal tidal streams predominate more and more as one penetrates into Bocht van Sukadana.

The directions of the tidal streams close off the Borneo coast are as follows on the rising and falling tides, respectively:—

Southward of Tanjong Sambar: west, and from east to south-east.

Between Tanjong Sambar and Sukadana: north to north-north-west, and south to south-south-east.

Eastward of Greig reefs: south and north.

Westward of Maja: south to south-south-east, and north to north-west.

In the clear, deep channel between the Karimata eilanden and the Lajah and Pelapis eilanden the monsoon currents predominate, running with increased force in the narrower parts and frequently accompanied by a sea. Between Maja and Panebangan the tidal streams predominate and the sea is calmer; vessels must always reckon with the possibility of silting up here.

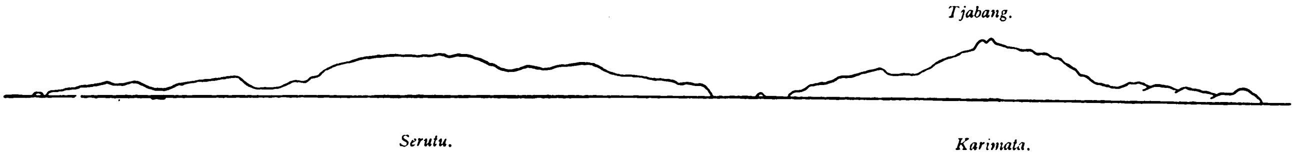
Off the mouths of the rivers northward of Maja the tidal streams predominate; the only effect of the monsoon winds here is a raising of the mean water level in the west monsoon, and a lowering in the east monsoon.

Charts 3757, 1964.

Coast. — Islands. — Dangers. — Beacon. — Tanjong Sambar, the south-western extremity of Borneo, is a sharp, rocky point with some trees on it; on the western side of the point is a prominent, fork-shaped tree, higher than the others, and visible 13 miles. Numerous rocks above water lie off the point, and a rock, which dries, lies about 1¼ miles southward of it. Penambun, about 5½ miles west-south-westward of Tanjong Sambar, has three isolated trees on it, which have the appearance of three rocks from a distance of 12 miles.

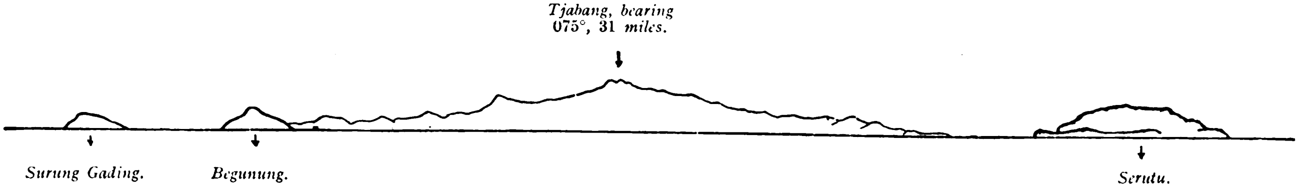
Charts 2160, 941a, 1263.

To face page 170.



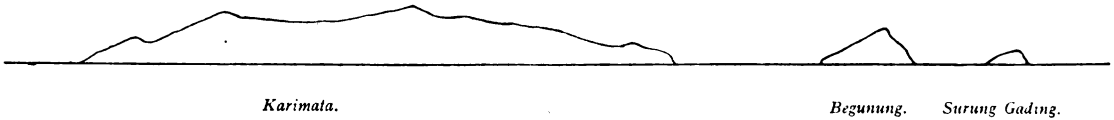
Karimata eilanden from half a mile eastward of Ontario reef.

(*Original dated* 1949.)



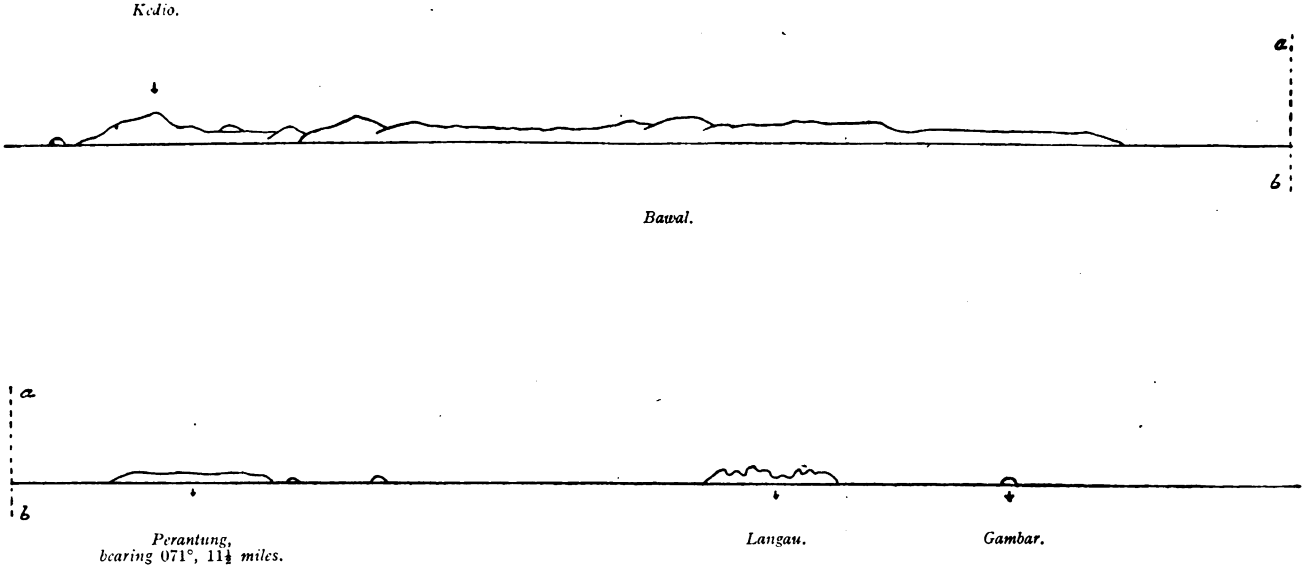
Karimata eilanden from west-south-westward.

(*Original dated* 1949.)



Karimata eilanden from northward, near Gwalia reef.

(*Original dated* 1949.)



View, in 2 parts, of islands off the western coast of Borneo.

(*Original dated* 1949.)

Charts 3757, 1964.

Mangkut (*Lat. 3° 04′ S., Long. 110° 13′ E.*), about 2 miles south-southwestward of Penambun, has one tree in the middle, visible from a distance of 14 miles. There are numerous rocks around these islets.

A beacon, surmounted by a ball, stands on a reef which dries, about 3½ miles south-eastward of Mangkut.

Gelam, about 1¼ miles westward of Tanjong Kepala, a point situated about 8 miles north-north-westward of Tanjong Sambar, is a very low, densely wooded islet, difficult to distinguish from westward, when it appears as a long, slightly darker strip against the coast behind. Foul and rocky ground extends for a considerable distance northward and southward from the island, and patches, with depths of less than 6 fathoms (11^{m}0) over them, extend for nearly 9 miles westward.

There is a bay with a sandy beach on the north-western side of Gelam, and there are depths of about 3 fathoms (5^{m}5) one mile offshore, where anchorage may be obtained by small vessels with local knowledge; above-water and sunken rocks lie off the points of the bay, especially off the northern point, where they usually break.

Chart 3757.

Langau, 3 miles westward of Gelam, is a moderately high, rocky islet with a rugged appearance, which is visible 14 miles in clear weather; Gambar, about 8 cables southward of Langau, consists of two rocks lying close together and covered with vegetation. Magnin, about 3½ miles northward of Gambar, is a prominent rock covered with vegetation, and Perantung, about half a mile north-eastward of Magnin, is low and rocky. Strong tidal streams are reported between these islands and the whole area within a distance of 6 miles southwestward of Gelam is encumbered with sandbanks and sunken rocks.

Corcyra bank, with a depth of 2 fathoms (3^{m}7) over it, lies 4 miles westward of Perantung (*Lat. 2° 50′ S., Long. 110° 05′ E.*), and there is another 2-fathom (3^{m}7) patch about 1¼ miles north-eastward of this bank. There is a 2½-fathom (4^{m}6) patch about 2 miles south-southeastward of Corcyra bank. All this area is dangerous owing to rocks and sandy shoals; depths of less than 6 fathoms (11^{m}0) extend up to fully 6 miles west-south-westward of Langau and 3 miles westward of Corcyra bank.

Bawal, a densely wooded, low island, except for two hills, 290 and 221 feet (88^{m}4 and 67^{m}4) high, respectively, lies with Tanjong Batang, its southern extremity, about 4 miles northward of Perantung. The area between Perantung and Bawal is foul. Tanjong Rotan, the southwestern extremity of Bawal, is a prominent headland. A bank, with a depth of 5½ fathoms (10^{m}1) over it, lies about 4 miles westward of Tanjong Rotan, and extends about 5 miles in a northward and southward direction. Reefs extend as much as one mile from the northern and western sides, and there are several rocks and islets off the northern extremity; amongst the islets are Langir and Tanah Merah, the latter being of a rounded shape and of a reddish colour, and the higher of the two. *See* view facing page 171.

Tanjong Batu Djurung. — Anchorage. — Directions. — Tanjong Batu Djurung, about 16 miles north-north-westward of Tanjong Kepala, is high and rocky, and a narrow ridge of hills culminating in a conical peak, 623 feet (189^{m}9) high, extends east-northeastward to the southern bank of Sungei Kendawangan. The coast for about 3 miles north-eastward of Tanjong Batu Djurung is high and rocky.

Charts 2160, 941a, 1263.

Chart 3757.

Two islets, the southern and larger named Iras, and the northern Tating, lie close off Tanjong Batu Djurung (*Lat. 2° 37′ S.*, *Long. 110° 09′ E.*). Tjempedak (Chempedak), a low thickly wooded islet, almost entirely surrounded by reefs and rocks, is situated nearly 1½ miles westward of this point; it has a rocky coast, except on the south-eastern side, where there is a sandy beach and a small settlement. The islet should not be approached within a distance of 6 cables on the seaward sides. There is a channel between Tjempedak and Iras, with depths of over 5 fathoms ($9^{m}1$) in the fairway; also between Tjempedak and Bawal, with depths of 6 fathoms ($11^{m}0$), but two reefs, with depths of 2 and 2½ fathoms ($3^{m}7$ and $4^{m}6$) over them, respectively, lie in the eastern part of the fairway and about three-quarters of a mile northward and 1¼ miles north-north-eastward, respectively, of Tanah Merah.

Sheltered anchorage may be obtained in both monsoons eastward of Bawal, in depths of from 7 to 11 fathoms ($12^{m}8$ to $20^{m}1$), mostly mud. This anchorage can only be reached by passing through the channel between Bawal and Tjempedak, which should be entered from westward by a vessel steering about 112° for a position a little northward of Tanah Merah, and altering course to about 090° when within 3½ cables of that islet, so as to pass southward of the 2-fathom ($3^{m}7$) reef at the eastern end of the channel. Course can then be altered southward, passing eastward of some rocks above water lying nearly half a mile eastward of Tanah Merah (*Lat. 2° 40′ S.*, *Long. 110° 07′ E.*). The channel eastward of Bawal is about one mile wide, but a rock, with a depth of 4 feet ($1^{m}2$) over it, lies about 1¾ miles north-eastward of the south-eastern extremity of Bawal, and there is a 5-foot ($1^{m}5$) patch about 1¼ miles eastward of the same point. A 1¼-fathom ($2^{m}3$) patch and a rock awash lie about 2 miles north-north-eastward and 2¼ miles east-north-eastward, respectively, of the same point, and there are two shoals, with depths of 2 and 2¾ fathoms ($3^{m}7$ and $5^{m}0$) over them, about 3 miles east-north-eastward and the same distance north-eastward, respectively, of the point.

Rede Kendawangan.—Sungei Kendawangan discharges about 6½ miles north-north-eastward of Tanjong Batu Djurung, and the mouth can be distinguished from a distance of about 4 miles, when a vessel is still in a depth of over 3 fathoms ($5^{m}5$); farther in the depths are very irregular, but the local fishermen have a sound knowledge of the channel. Depths of less than 6 fathoms ($11^{m}0$) extend up to 12 miles westward of the mouth of the river; a drying patch lies about 4 miles south-westward of the mouth of Sungei Kendawangan and 2 miles offshore.

There is a depth of 7 feet ($2^{m}1$) on the bar at low water, and about 13 feet ($4^{m}0$) at high water. There are several above-water and sunken rocks on the northern side of the entrance, Batu Buaja, situated about 1¼ miles westward of the northern entrance point, being one of them. Karang Aluran, a rock with less than 6 feet ($1^{m}8$) over it, lies about 4 cables south-eastward of Batu Buaja. The Djambat (Jambat) eilandjes, about one mile northward of Batu Buaja, consist of three low islets and several rocks. *See* view facing page 176.

Within the entrance the river is deep and broad, so that above Kendawangan, situated just within the entrance, it is navigable for small power vessels as far as Kampong Landjut (Kendawangan, chart 941a), a small Malay settlement about 22 miles above the entrance.

Coast.—Off-lying islets.—Dangers.—The coast between the mouth of Sungei Kendawangan and Tanjong Bakau, about 4 miles north-north-westward, is fringed by many above-water and sunken rocks. Kutjing (Kuching), an islet, lies about 1¼ miles northward of Djambat eilandjes.

Tanjong Gangsa (*Lat. 2° 26′ S., Long. 110° 09′ E.*), about 6 miles northward of the mouth of Sungei Kendawangan, is high and rocky, and is fringed by above-water and sunken rocks, which extend as much as one mile southward from the point. The land in the vicinity is hilly; Kedio, 1,611 feet ($491^{m}0$) high, about 10 miles north-eastward of Tanjong Gangsa, is prominent. Between Kedio and Tanjong Gangsa is a hilly and rugged ridge with three prominent peaks; Gehakkeld bergje (Cleft hill), Kegel bergje (Conical hill), and Zadel berg (Saddle hill), 656, 666 and 709 feet ($199^{m}9$, $203^{m}0$ and $216^{m}1$) high, respectively.

The coast between Tanjong Gangsa and Tanjong Pagar Antimun, about 12 miles northward, is low; Sungei Tengar discharges nearly 4½ miles northward of Tanjong Gangsa. Tanjong Pagar Antimun is a hilly peninsula, 269 feet ($82^{m}0$) high, with rocky sides; it is visible from a distance of 20 miles when it appears like a small mountain with a gentle slope on its western side. A small islet lies close off the southern side of the point, and a coral reef and rocks extend about half a mile from the northern side.

Sawi is a low island situated about 5½ miles north-westward of Tanjong Gangsa; there are some high trees on it, especially on the western side, which are visible about 12 miles. It is fringed by rocks except on its northern side, and depths of less than 3 fathoms ($5^{m}5$) extend nearly 2 miles eastward from the island.

Onrust rif, nearly 6 miles north-westward of Sawi, has a small patch of light-brown sand and white coral on it, which dries, and appears at a distance as a small sandbank; about 3 cables north-westward of this patch are some large rocks with depths of about 2 feet ($0^{m}6$) over them. The reef is steep-to, and the bottom around is mostly sand.

Mengkudu, about 4½ miles westward of Tanjong Pagar Autimun, is a steep rock about 26 feet ($7^{m}9$) high, sparsely covered with vegetation, and having two trees on it; the rock is surrounded by a steep-to coral reef, with some rocks above water.

A coral reef, with some large rocks on it which dry, usually marked by breakers, lies about 2 miles north-westward of Tanjong Pagar Antimun.

The coast between Tanjong Pagar Antimun and Tanjong Beras Basah, about 26 miles north-north-westward, is low and thickly wooded. This part of the coast should not be approached within a depth of less than 5 fathoms ($9^{m}1$) or nearer than about 3 miles, as within that distance there are ridges of sand and the depths are irregular. The low islet Tjebe (Chebe) lies about one mile northward of Tanjong Bengkuang, which is situated about 3½ miles north-north-eastward of Tanjong Pagar Antimun (*Lat. 2° 15′ S., Long. 110° 04′ E.*).

Sungei Pesaguan discharges about 9 miles northward of Tanjong Bengkuang, but there is a depth of only 3 feet ($0^{m}9$) on the bar off

Chart 3757.

the mouth; about a mile within the entrance, where there is a small village on the southern bank, there are depths of from 2 to 2¾ fathoms (3^m7 to 5^m0). Praus can reach Sungei Pawan by tributaries from Sungei Pesaguan.

A bank, with a least depth of 4½ fathoms (8^m2) over it, lies about 6 miles west-south-westward of the mouth of Sungei Pesaguan.

Charts 3757, 3758.

Sungei Pawan. — Ketapang. — Buoy. — Beacons. — Pilot. — Anchorage.—Sungei Ketapang and Sungei Kandang Karbau are the two principal arms of the delta of Sungei Pawan; Muara Kajung, the capital of the well populated and prosperous Matan district, is situated about 60 miles up the latter river. Sungei Ketapang discharges immediately northward of Tanjong Beras Basah, a low mud point fronted by a coastal bank, which in 1949 had extended considerably north-westward; its mouth dries. Vessels, without local knowledge, should not attempt to enter without a local pilot.

Ketapang, the headquarters of a Government official and the usual residence of the native prince of Matan, is situated about 3 miles up the Sungei Ketapang, but power vessels can only reach the place through Sungei Kandang Karbau. There is a pier at Ketapang, with a depth of about 4 feet (1^m2) alongside.

The channel leading to Sungei Kandang Karbau is liable to shift according to the prevailing monsoon and there is often a considerable sea here; it leads partly over the drying portion. The bottom consists of mud and sand. The tidal streams set across the channel, at a rate of from 2 to 2½ knots with the ebb tide, but there is little or no stream with the flood tide.

A conical buoy, painted black and red in horizontal bands, and surmounted by a ball, is moored about 1½ miles westward of Tanjong Bawang (*Lat. 1° 47′ S., Long. 109° 55′ E.*), the southern entrance point of Sungei Kandang Karbau. A drying reef lies about one mile north-north-westward of Tanjong Bawang and, in 1946, the drying coastal bank north-westward of that point had extended considerably, while the 5-fathom (9^m1) and 10-fathom (18^m3) lines westward of the point appeared to lie about 2 cables further westward than charted. A 3¼ fathom (5^m9) patch is situated about 4¼ miles westward of Tanjong Bawang, and two 6-fathom (11^m0) patches lie, respectively, about 11¼ miles westward and 7½ miles west-south-westward of the same point.

The northern side of the channel to Sungei Kandang Karbau is marked by four beacons surmounted by black triangles, and the southern side by three beacons, surmounted by baskets. On application to the Indonesian pilot at Kandang Karbau *white fixed* lights will be exhibited from the four beacons on the northern side of the channel and from the middle beacon on the southern side; all these beacons are privately maintained.

A submarine telephone cable crosses the river eastward of Kandang Karbau, a village on the southern side of the entrance; the shore ends are marked by notice boards. A swing bridge, with a horizontal clearance of 148 feet (45^m1), spans the river about 1½ miles below Sentap, a village situated about 4¾ miles east-south-eastward of Kandang Karbau; warning boards are placed about a quarter of a mile above and below stream of the bridge. At night, two *red fixed* lights

Charts 2160, 941a, 1263.

Charts 3757, 3758.

indicate that the bridge is closed, and two *green fixed* lights indicate that it is open. *See* pages 18-20.

An Indonesian, living near the Customs station, will, on request, act as unofficial pilot.

The limits of Rede Ketapang are the parallels through Tanjong Beras Basah and the mouth of Sungei Awan, which flows out about 4 miles east-north-eastward of Tanjong Bawang, and the line drawn 022°—202° through the buoy off the entrance to the Kandang Karbau. There is anchorage, sheltered from south-westerly swell, northward of Adung (*Lat. 1° 46′ S., Long. 109° 57′ E.*), an islet lying close off the northern entrance point of Sungei Kandang Karbau, in depths of from 2 to 2¾ fathoms ($3^{m}7$ to $5^{m}0$).

During the east monsoon it may be necessary to enter the Kandang Karbau at night, owing to the fact that high water of the predominating diurnal tide occurs between sunset and sunrise. During the west monsoon, when high water occurs during the daytime, the prevailing winds frequently raise the level of the water by fully one foot ($0^{m}3$), so that greater depths than the chart shows may then be expected.

Ketapang is connected with the regional telephone system.

Chart 3758.

BOCHT VAN SUKADANA.—Bocht van Sukadana, entered between Tanjong Beras Basah and Tanjong Kluwang, about 40 miles north-westward, is only of importance for local navigation between Ketapang, Sukadana and Pontianak, through Selat Maja. The eastern shore of the bay, between Tanjong Beras Basah and Tanjong Gunung, a prominent rocky point about 32½ miles north-north-eastward, is low, marshy and thickly wooded; north-westward of the latter point the coast becomes higher and rocky.

The following peaks are prominent: Tunggal, 312 feet ($95^{m}1$) high, situated about 17½ miles north-eastward of Tanjong Beras Basah and about 6 miles inland; Seberuang, 2,435 feet ($742^{m}2$) high, about 8½ miles eastward of Tanjong Gunung, with a small nipple on the summit; and Palung, 3,658 feet ($1{,}114^{m}9$) high, a table-topped mountain about 9½ miles north-eastward of Tanjong Gunung (*Lat. 1° 18′ S., Long. 110° 02′ E.*). There are several mountains around Sukadana, the most prominent being Lobang Tedong, 1,801 feet ($548^{m}7$) high, situated about 4½ miles north-westward of Tanjong Gunung, and Pekadjang, 1,684 feet ($513^{m}3$) high, about 5 miles farther north-westward, both of which are conical.

Islets. — Dangers. — Fishing stakes. — Tjempedak, Sempadeh besar and Sempadeh kechil, 302, 308 and 289 feet ($92^{m}0$, $93^{m}9$ and $88^{m}1$) high, respectively, are three thickly wooded islets, with rocky sides, lying near the coast about 7 miles southward of Tanjong Gunung; they are visible from 20 to 24 miles in clear weather.

A rock, covered with vegetation, lies close to the south-eastern extremity of Sempadeh besar, and there is a 3½-fathom ($6^{m}4$) patch about 6 miles south-westward of the same island and about 5 miles offshore.

Several above-water and sunken rocks lie within a distance of 2 miles off Tanjong Gunung, and Tokong Pentjalang, about 1¾ miles westward of the point, is the outermost of these; the coast here should not be approached in a depth of less than 3 fathoms ($5^{m}5$). Pajung, Tjermin

Charts 2160, 941a, 1263.

and Nanas are three rocky islets lying between Tokong Pentjalang and Tanjong Gunung (*Lat. 1° 18′ S., Long. 110° 02′ E.*).

Djuanta is a rocky, thickly wooded islet, 492 feet (150^m0) high, about 8 miles west-south-westward of Tanjong Gunung; it has a conical summit, and is a good landmark for the channel to Selat Maja. *See* view facing page 177. Katung, 168 feet (51^m2) high and about one mile south-westward of Djuanta, is also rocky and thickly wooded. Some above-water rocks lie about midway between these two islets, and there is a reef, which usually breaks, about half a mile north-westward of Katung; some above-water and sunken rocks lie about 1¼ miles east-south-eastward of Djuanta.

Many fishing stakes may be encountered on the north-western side of Bocht van Sukadana, in an area extending a considerable distance offshore between Tanjong Kluwang and Tanjong Satai (page 177); in 1947, the outermost fishing stake was reported to exist in a position about 10 miles eastward of Tanjong Kluwang.

Rede Sukadana. — Beacons. — Anchorages. — Sukadana, the headquarters of a Government official, is situated on the northern side of the mouth of Sungei Sukadana, which discharges into a small bay about 6½ miles north-westward of Tanjong Gunung. The mouth of this river is almost closed by a stone dam, which covers at half tide; some beacons, privately maintained, mark the channel leading to, and through the opening in the dam. The landing place is just within this dam and on the northern bank of the river. There is frequent communication with Pontianak, through Selat Maja (page 177), by small power vessels. Sukadana is connected with the regional telephone system.

Some rocks, and the small islet Salahnama, lie close off Tanjong Krunut, the southern entrance point of the bay. The high land in the vicinity of Tanjong Krunut is visible from 32 to 36 miles in clear weather. Datok is a thickly wooded islet lying close off the coast about one mile south-eastward of Tanjong Datok, but is somewhat difficult to identify, although it has some coconut trees on it. Pelintuan is a small islet, 50 feet (15^m2) high, situated close off the coast about 3½ miles north-westward of Tanjong Krunut.

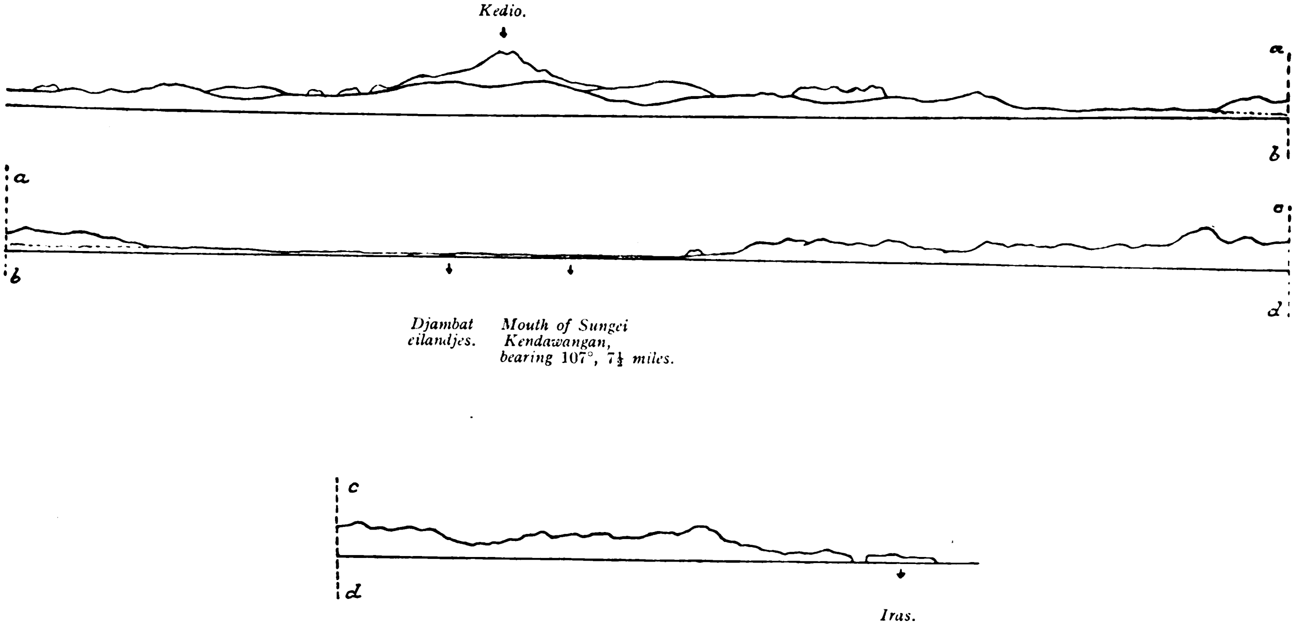
The limits of the roadstead are the meridian through Pelintuan, and the parallel through Tanjong Penaga, which is situated about 2 miles south-eastward of Tanjong Krunut.

Small craft can anchor in the bay, in a depth of about 1½ fathoms (2^m7), soft mud, northward of Salahnama, well sheltered during the south-east monsoon. Vessels unable to enter the bay usually anchor about 3½ miles west-south-westward of Sukadana, in a depth of about 2½ fathoms (4^m6), soft mud; farther in the ground swell is very inconvenient, as the current from the rivers northward of Sukadana usually sets a vessel beam on to the wind.

Sungei Sempang.—Sungei Sempang discharges about 7½ miles northward of Tanjong Krunut, but it can only be entered by vessels of light draught, as there is an extensive flat of soft mud off the mouth; the channel over this flat is marked by three black cone beacons, maintained privately, and had a depth, in 1948, of about 3 feet (0^m9).

Telok Melano (*Lat. 1° 06′ S., Long. 109° 58′ E.*), the capital of the district and the residence of a native chief, is situated on the northern bank of the river and about 2 miles within the mouth. There are also

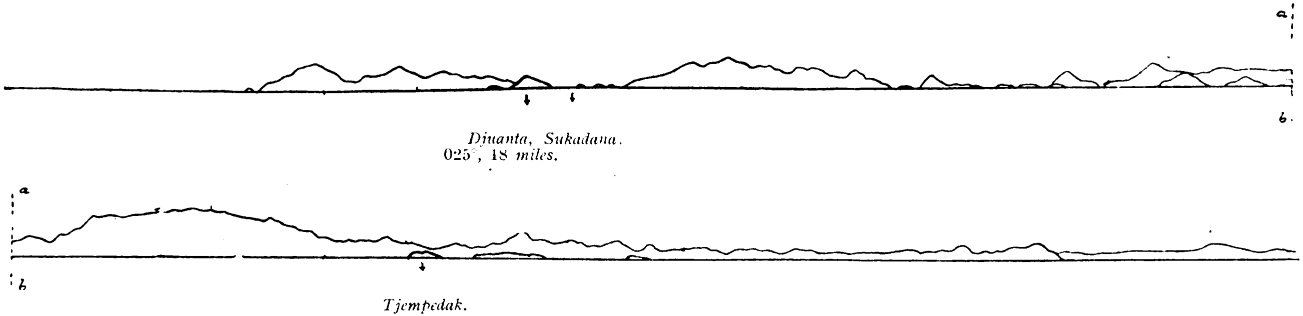
To face page 176.



View, in 3 parts, of the western coast of Borneo.

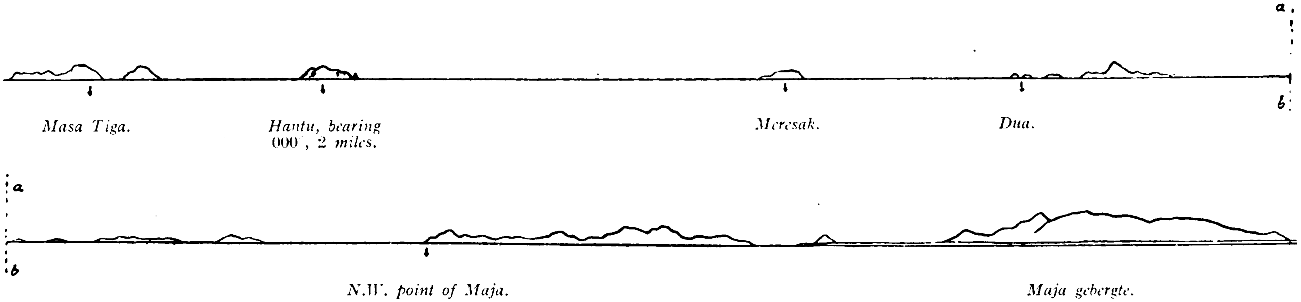
(*Original dated* 1929.)

To face page 177.



View, in 2 parts, of the approach to Sukadana.

(Original dated 1929.)



View, in 2 parts, westward of Telok Nuri.

(Original dated 1929.)

Chart 3758.

several villages near the mouth of the river. A car ferry crosses the river at Telok Melano. There is a pier for small vessels, with a depth of 8 feet ($2^{m}4$) alongside, near the dwelling of the native chief. There is a tide gauge on this pier which shows the depth over the shoalest part of the approach channel to Sungei Sempang; at low water spring tides it shows 3½ feet ($1^{m}1$).

A submarine telephone cable crosses the river at Telok Melano, and its position is indicated by notice boards.

Selat Maja.—Beacons.—Selat Maja is the narrow channel between Maja, an island which forms the northern side of Bocht van Sukadana, and the main coast; the southern entrance is about 3 miles wide, but the navigable channel is reduced to barely half a mile by mud flats which extend from either side. Kumbang, 293 feet ($89^{m}3$) high, is a prominent hillock on the eastern entrance point; otherwise the land on both sides is low, and a great portion of the eastern side of Maja is submerged at high water. There is a least depth of 1¼ fathoms ($2^{m}3$) on the extensive bank off the southern entrance to this channel, and within the river mouth there are depths of from 3¾ to 6½ fathoms ($6^{m}9$ to $11^{m}9$). The bank off the entrance consists mostly of soft mud, but that which extends from Tanjong Turun, the western entrance point, is steep-to and tolerably hard, and the edge is sometimes marked by surf. The western side of the channel is marked by two black beacons, each fitted with a truncated conical topmark; the southern of these marks the edge of the bank which extends from Tanjong Turun, and the other one is about 3¾ miles farther north-north-westward.

Charts 3758, 3721.

Small vessels with local knowledge, trading between Sukadana and Pontianak, frequently make use of the southern arm of Selat Maja; *see* Route I of the Inner routes to Pontianak on page 184.

Chart 3758.

Maja.—Maja is high in the north-western part, where the Maja gebergte and the double-peaked Dusun of 1,737 feet ($529^{m}4$) high, are situated, but the remainder of the island is low and marshy almost throughout. There is a rocky hillock, 162 feet ($49^{m}4$) high, on Tanjong Satai, situated about 7½ miles south-westward of Tanjong Turun, and Berantak, another rocky hillock, 325 feet ($99^{m}1$) high, is situated about 2¾ miles northward of Tanjong Kluwang, the southern extremity of the island.

A mudbank, with depths increasing regularly seaward, extends from the southern side of the island; off Tanjong Pasir, the south-western extremity, this bank is harder, and is steep within the depth of 2 fathoms ($3^{m}7$). Perling (*Lat. 1° 14′ S., Long. 109° 24′ E.*), 135 feet ($41^{m}1$) high, about 1¾ miles northward of Tanjong Pasir, and Aroh, 194 feet ($59^{m}1$) high, about one mile south-eastward of Perling, are two rocky islets which appear as hills on the coast from a distance.

Telok Nuri, on the northern side of Maja, is described on page 182, and the western coast of Maja on page 182.

CHANNELS EASTWARD OF KARIMATA.—Between Karimata (page 168) and the western coast of Borneo there are several groups of islands, and between these are three safe channels, which will be described hereafter in the following order:—(1) The Inner

Charts 2160, 941a, 1263.

route, which leads eastward of the Vogelnest and Lajah eilanden, and thence between Maja and Panebangan. (2) Greig channel, as it is known locally, leads eastward of the Vogelnest eilanden and Papan, westward of the Lajah eilanden, and thence between Panebangan and the Pelapis eilanden. (3) The channel between the Pelapis eilanden and Buan.

Inner route.—This route is usually taken by small vessels proceeding to Pontianak through the delta of the Sungei Kapuas (Groote Kapoeas rivier), as described in Route II on page 185. There is less sea than in the open part of Straat Karimata, and vessels have the opportunity of anchoring if necessary; with local knowledge this route can be navigated at night by soundings.

The Vogelnest and Papan eilanden, with the adjacent dangers, are described with Greig channel, where they are more appropriate.

The Lajah eilanden consists of several rocky, thickly wooded islets. Lajah kechil, the south-westernmost islet, 168 feet ($51^{m}2$) high, lies about 16 miles south-westward of Tanjong Kluwang (*Lat. 1° 18′ S., Long. 109° 30′ E.*) and can be distinguished from the others as it is entirely covered with coconut trees. Mensigi is situated about 1½ miles north-eastward of Lajah kechil, and between them is Lajah besar, 328 feet ($100^{m}0$) high; a reef, with some above-water rocks on it, lies about a quarter of a mile westward of Mensigi. Meledang, the largest islet of the group, 420 feet ($128^{m}0$) high, lies with its southern extremity about 1½ miles eastward of Mensigi, and the Inner route passes eastward of it. Bulat, a small islet, 154 feet ($46^{m}9$) high, is about three-quarters of a mile northward of Meledang, and two small islets lie within half a mile west-south-westward of it.

There is a deep channel, known locally as Lajah vaarwater, between Meledang and Mensigi, but Rob Roy rock, a small coral reef with a depth of 2½ fathoms ($4^{m}6$), lies in mid-channel about one mile north-eastward of Mensigi and is not marked in any way; it is steep-to on its northern and western sides. Kate of Auckland rock, with a depth of 1¼ fathoms ($2^{m}3$) over it, is situated on the western side of the channel and nearly one mile north-westward of Mensigi; it is not marked by discoloration, but it sometimes breaks and there are often tide-rips. There is usually a monsoon current with a rate of from 1¼ to 2 knots in the strength of the monsoons, in this channel; in the north-west monsoon the direction of this current is south-by-east, and in the south-east monsoon north-north-west. During the transition periods in April and October, the tidal streams become noticeable but the rate does not exceed half a knot, setting southward with rising water and northward with falling water, the direction changing fairly regularly once a day.

Burung, about 5 miles west-south-westward of Tanjong Pasir, is a rocky islet, 171 feet ($52^{m}1$) high, which forms a good landmark for the Inner route.

Panebangan is a mountainous, thickly wooded island lying with its southern extremity about 9½ miles westward of Tanjong Pasir. The summit of the island, situated in the southern part, is 1,716 feet ($523^{m}0$) high; it is visible 40 miles in clear weather. Korok is an islet lying close off the south-eastern extremity of Panebangan; Aur are two wooded islets, the northern being 167 feet ($50^{m}9$) high, situated about 3½ miles eastward of the summit of Panebangan, and Djulai,

Chart 3758.

about 1¼ miles north-westward of Aur, is also wooded. Trusan Hadji is a high islet lying close off the eastern extremity of Panebangan, and there are some above-water rocks about half a mile north-eastward of it. The tidal streams are usually strong along the eastern coast of Panebangan. A rock above water lies about half a cable off the northern point of the island.

Charts 3758, 3757.

Greig channel.—Greig channel is frequently used by vessels proceeding between Java and Pontianak. Tokong Perangin, the southernmost danger on the western side of the channel, lies about 16 miles south-south-westward of Lajah kechil (*Lat. 1° 31′ S., Long. 109° 20′ E.*) and is a steep, bare rock, 53 feet ($16^{m}2$) high, of a dark colour, appearing at a distance of about 8 miles as a small black cone, and forms a good landmark when approaching from southward; there is a reef with some above-water rocks on it, about half a mile south-eastward of this rock.

Chart 3758.

The Vogelnest eilanden are a group of five steep islets surrounded by coral reefs; Krawang, the easternmost islet, 85 feet ($25^{m}9$) high, lies nearly 6 miles east-north-eastward of Tokong Perangin, and edible birds' nests are found in the caves. Sumur, 79 feet ($24^{m}1$) high, is nearly 2 miles westward of Krawang. Uma, 154 feet ($46^{m}9$) high, lies about 8 cables northward of Sumur. Pelubang, about three-quarters of a mile northward of Uma, is the northernmost island and is 145 feet ($44^{m}2$) high. Ajer, 121 feet ($36^{m}9$) high, the westernmost island, is situated about 3 cables west-south-westward of Uma. A rock, with a depth of 2 feet ($0^{m}6$) over it, lies about 2½ miles west-north-westward of Ajer.

Papan, Tawas, and Matjan are three rocky islets surrounded by coral reefs; Papan, the southernmost and largest islet of the group, is 227 feet ($69^{m}2$) high, and lies about 4½ miles northward of Krawang. Matjan, about three-quarters of a mile northward of Papan, is 125 feet ($38^{m}1$) high; a rock above water lies close westward of this islet.

The Lajah eilanden have been described with the Inner route on page 178.

The Gurung eilanden, about 9 miles north-westward of Lajah kechil, are two rocky, wooded islets lying close together on a narrow reef; the best landing place is on the eastern side of the western islet, which is 312 feet ($95^{m}1$) high. A coral reef, with a depth of 1¼ fathoms ($2^{m}3$) over it, lies about half a mile eastward of the eastern islet, and is not marked by surf or discoloration, but there are usually tide-rips over it.

Suka, about 7 miles north-westward of the western of the Gurung eilanden, is a thickly wooded islet, 285 feet ($86^{m}9$) high, with steep, rocky sides. Tallack, a coral reef with a least depth of 2 fathoms ($3^{m}7$), lies about 2 miles south-south-eastward of Suka; in calm weather and a strong tidal stream it is marked by tide-rips.

The Pelapis eilanden consist of five high, thickly wooded, rocky islands and two islets. Genting, 1,037 feet ($316^{m}1$) high, lies with its southern extremity nearly 1½ miles north-eastward of Suka (*Lat. 1° 21′ S., Long. 109° 07′ E.*). Kelawar, situated about half a mile westward of the summit of Genting, is the westernmost island; there is a small islet, 135 feet ($41^{m}1$) high, about 3 cables south-westward of

Charts 2160, 941a, 1263.

Chart 3758.

its southern extremity. Aer Masin, 610 feet (185^{m}9) high, is situated about 2 cables north-north-westward of the northern extremity of Kelawar; a rock, with a depth of less than 6 feet (1^{m}8) over it, lies about 2 cables westward of its western extremity. Balai, lying close north-eastward of Genting, is 1,060 feet (323^{m}1) high. Dua, 351 feet (107^{m}0) high and the easternmost island, has two prominent hills on it, which give it the appearance of two islets from a distance, and is situated nearly 2 miles eastward of the northern extremity of Balai; a 3¾-fathom (6^{m}9) patch lies about 4 cables south-south-eastward of Dua. Bulat, about one mile north-westward of Dua, is a small hummock-shaped islet.

Sireh (*Lat. 1° 14′ S., Long. 109° 12′ E.*), with its southern extremity about 1¾ miles north-north-eastward of Dua, is a hilly island, 410 feet (125^{m}0) high. A low islet lies close off its northern point. There is a safe passage between Sireh and Dua, and also between Sireh and Panebangan.

A 5½-fathom (10^{m}1) patch lies about 5¾ miles north-north-westward of Sireh.

Anchorages.—Between the Pelapis eilanden is a fine bay or basin, nearly one mile broad and with depths of from 8 to 9 fathoms (14^{m}6 to 16^{m}5), mud; this bay is open on the northern side, but affords excellent shelter from wind and sea in the south-east monsoon. A gently sloping sandy beach on the northern side of Genting, where there is a rivulet of fresh water, affords a good opportunity for repairing small craft. The main entrance to this bay is from northward, but there is also a clear channel between Aer Masin and Kelawar, although in 1925 less depths than the chart shows were reported here; there are coral reefs in the other two entrances, so that they are impracticable for large vessels. On the eastern side of the bay is a coral reef, with some above-water rocks on it, which extends about 3 cables from Balai. A good mark for anchoring is with the north-eastern extremity of Genting just open clear of the south-western side of Balai. The bay is frequented by fishermen from Karimata.

In the north-west monsoon good anchorage can be obtained on a mud flat, with depths of from 5½ to 6½ fathoms (10^{m}1 to 11^{m}9), which extends about 2 miles eastward from the southern of the Pelapis eilanden.

Channel between the Pelapis eilanden and Buan.—The broad channel between Suka and Buan, about 8½ miles south-south-westward, is seldom used. Buan has a prominent conical summit, 1,014 feet (309^{m}1) high; the northern side of the island, where there is a narrow, foul bay, is steep-to. Nibung, 79 feet (24^{m}1) high, nearly one mile eastward of Buan, and Ular, 66 feet (20^{m}1) high, about 1¼ miles westward of this island, are rocky islets with a few trees on them. A reef, which dries and usually breaks, lies about 1¾ miles east-south-eastward of Nibung, and there is a 5-fathom (9^{m}1) patch about 4 cables south-south-westward of this reef. A 4-fathom (7^{m}3) patch lies about half a mile south-eastward of Nibung.

Islets and dangers eastward and south-eastward of Karimata.—Anchorage.—A shoal, with a depth of 1¾ fathoms (3^{m}2) over it, lies nearly 8½ miles west-south-westward of Tokong Perangin and about 17½ miles east-south-eastward of Tanjong Dungu (Doeng), the southern extremity of Karimata.

Charts 2160, 941a, 1263.

Chart 3758.

Genteng, 123 feet (37^{m}5) high, is situated about 8 miles south-eastward of Tanjong Serunai, the eastern extremity of Karimata. Mentangor and Gresik, 207 and 123 feet (63^{m}1 and 37^{m}5) high, respectively, lie about a half and 1½ miles, respectively, eastward of Genteng. These three islets are thickly wooded and spherical in shape. Besi, about 3½ miles north-westward of Genteng, is rendered prominent by a sharp peak rising like a tower to a height of 153 feet (46^{m}6) from its otherwise flat top; in the north-west monsoon good anchorage can be obtained between Besi and Genteng, in a depth of 6½ fathoms (11^{m}9), mud, but it can only be approached from southward.

Lising (*Lat. 1° 36′ S., Long. 109° 09′ E.*), about 6½ miles north-eastward of Genteng, has a flat top, 384 feet (117^{m}0) high, and is surrounded by a reef having three rocks, covered with vegetation, on its south-eastern side; a 2½-fathom (4^{m}6) patch lies about 1¼ miles south-eastward of Lising. The area between this islet and Karimata is obstructed by reefs and should be avoided. Pandan, 92 feet (28^{m}0) high, about 1½ miles northward of Lising, is a rock covered with vegetation, and there are other rocks on the surrounding reef; it can be seen from a distance of from 8 to 12 miles and is a useful landmark. A 3-fathom (5^{m}5) patch of coral lies about 2 miles north-north-westward of Pandan and depths of less than 5 fathoms (9^{m}1) extend for a distance of half a mile northward of this coral patch. Bakung besar, about 2 miles south-eastward of Pandan, is a rounded islet, 184 feet (56^{m}1) high, with steep, rocky sides. Bakung kechil, 162 feet (49^{m}4) high, is situated about three-quarters of a mile north-eastward of Bakung besar and is similar to that islet. A reef, with a depth of 1½ fathoms (2^{m}7), lies nearly 1½ miles south-eastward of Bakung kechil, and there are two 4-fathom (7^{m}3) patches about one mile northward of that islet. All these islets should be given a wide berth, as there are several other reefs in their vicinity.

Islets and dangers northward of Karimata.—Jamsetjie reef (*Lat. 1° 24′ S., Long. 108° 51′ E.*), with a depth of 5 fathoms (9^{m}1) over it, lies about 8½ miles north-north-westward of Tanjong Senna, the northern extremity of Karimata; at a distance of over one mile from the reef there are depths of about 14 fathoms (25^{m}6), sand and mud, and within that distance, on the south-eastern side of the reef, there are depths of from 9 to 11 fathoms (16^{m}5 to 20^{m}1), sand and stones. There is a clear channel either northward or southward of Jamsetjie reef.

The Leman eilanden consist of five rocky islets, surrounded by reefs. Leman Paku, the easternmost and largest, is 174 feet (53^{m}0) high and lies nearly 15 miles northward of Tanjong Senna. Leman Budi, the north-western islet, situated about 1¾ miles west-north-westward of Leman Paku, is 103 feet (31^{m}4) high, rounded and covered with vegetation; between this islet and the remainder there is a clear channel with a least depth of 14 fathoms (25^{m}6), but the Leman Budi side should be held. Tikus, 69 feet (21^{m}0) high, lies about 1¼ miles west-south-westward of Leman Paku and the reef surrounding it extends for about 3 cables from the south-western side; there is a large rock above water on this reef. Leman Tukung and Leman Goa, 112 feet (34^{m}1) high, lie close together on a reef, with some above-water rocks on it, about 6 cables north-westward and 5 cables west-north-westward, respectively, of Leman Paku.

Charts 2160, 941a, 1263.

Charts 3721, 3758.

COAST.—Western side of Maja.—Between Tanjong Pasir (page 177) and Tanjong Tjap Belanda, the north-western extremity of Maja, about 18 miles north-north-eastward, the coast is low and marshy. The only landmarks, with the exception of Maja gebergte and Dusun already described on page 177, are a hill, 384 feet ($117^{m}0$) high, about one mile east-north-eastward of Tanjong Gunung, a low point about 6 miles north-north-eastward of Tanjong Pasir, and a group of hills near the north-western corner of Maja, of which Sebiau, 694 feet ($211^{m}5$) high, is the highest. The islets of Perling and Aroh have been described on page 177. The small islet of Nenas lies close offshore about 3½ miles south-south-westward of Tanjong Tjap Belanda.

Telok Nuri.—Telok Nuri is situated on the northern side of Maja (page 177) and is entered between Tanjong Tjap Belanda and Tanjong Terung, about 5½ miles west-north-westward; the western arm of Selat Maja is entered from the head of this bay. Close together on the northern side of the bay are two hills Sarat and Bongkok, 741 and 1,079 feet ($225^{m}9$ and $328^{m}9$) high, respectively, and at the head is Rumbur which has three prominent peaks, the highest being 851 feet ($259^{m}4$) high. Nuri, 630 feet ($192^{m}0$) high, lies midway between Sarat and Rumbur and about three-quarters of a mile inland.

Hantu is a thickly wooded islet lying in the middle of the entrance to the bay, and in clear weather is visible fully 12 miles, when it appears as a small hummock. The two Masa Tiga eilanden, on the northern side of the entrance, are steep and rocky, and the western islet, 391 feet ($119^{m}2$) high, situated about 7 miles north-north-westward of Hantu (*Lat. 1° 03′ S., Long. 109° 18′ E.*) is usually visible about 20 miles; the eastern islet is 384 feet ($117^{m}0$) high. Meresak, 194 feet ($59^{m}1$) high, is a wooded islet about 6 miles eastward of Masa Tiga; Dua are two rocks, covered with vegetation, lying about 1½ miles south-eastward of Meresak, the northern being 92 feet ($28^{m}0$) high. *See* view facing page 177.

The channel through Telok Nuri runs for some miles in a north-easterly direction from a position about 4 miles eastward of Hantu (*Lat. 1° 03′ S., Long. 109° 18′ E.*), and then curves gradually eastward to the entrance of the western arm of Selat Maja; south-eastward of Hantu is a bar with a least depth of 2¾ fathoms ($5^{m}0$).

Directions.—Vessels making for Telok Nuri from westward should steer for the highest peak of Dusun, situated in the north-western part of Maja, bearing 080°, until the centre of Hantu is in line with the middle of the western of the Masa Tiga eilanden, bearing about 336°, taking care to avoid the 5½-fathom ($10^{m}1$) shoal about 5¾ miles north-north-westward of Sireh (page 180); a north-easterly course may then be steered over the bar. On the flat northward and north-westward of the channel there is frequently driftwood, and heavy tree trunks are sometimes embedded here.

Vessels bound for Pontianak can proceed into Selat Lida by the western arm of Selat Maja, and thence into Sungei Kapuas (Groote Kapoeas rivier) by Selat Mendawak; or they can follow the route given on page 184, through Selat Lida, Selat Padu Ampat, etc.

Chart 3721.

Coast.—The coast between Tanjong Terung, *see* above, and Tanjong Padang Tikar, the southern entrance point to Selat Padang Tikar (Padang Tikar rivier), about 19 miles north-north-westward, is

Charts 2160, 941a, 1263.

Chart 3721.

formed by the western side of Padang Tikar, and is low and fronted by an extensive mudbank, with a few sandy ridges running nearly parallel to the coast; vessels should keep in depths of not less than 5 fathoms ($9^{m}1$), and give this coast a berth of about 9 miles.

Mouth of the Selat Padang Tikar.—Buoys.—Selat Padang Tikar (Padang Tikar rivier) is entered between Tanjong Padang Tikar and Tanjong Burung, about 6½ miles north-westward, and has the deepest entrance of any river on the western coast of Borneo; the least depth in the channel over the bar off the mouth is 3¼ fathoms ($5^{m}9$).

Within Tanjong Padang Tikar the river flows along the northern side of Padang Tikar, and connects with Selat Lida by means of Selat Padu Ampat. The mouth of the Selat Padang Tikar (Padang Tikar rivier) is also the starting point of Routes III and IV of the Inner routes to Pontianak, described hereafter.

A black can buoy, surmounted by a truncated cone, is moored off the entrance to Selat Padang Tikar (Padang Tikar rivier) and about 10 miles westward of Tanjong Padang Tikar (*Lat. 0° 40′ S., Long. 109° 15′ E.*).

A white conical buoy is moored about half a mile northward of Tanjong Padang Tikar on the southern side of the channel.

In 1950, the shore bank on the north-western side of the channel about 3 miles north-eastward of Tanjong Padang Tikar was reported to have extended south-eastward.

Radak is an isolated, table-shaped hill, 669 feet ($203^{m}9$) high, situated about 8 miles north-eastward of Burung, and Terjun, 246 feet ($75^{m}0$) high, about 3¼ miles west-south-westward, has two prominent trees on its summit.

Directions.—Caution.—Vessels approaching the mouth of Selat Padang Tikar (Padang Tikar rivier) should cross the bar on an easterly course from the black can buoy off the entrance, and then pass northward of the white conical buoy moored about half a mile northward of Tanjong Padang Tikar. After passing this buoy vessels bound for Selat Kubu kechil or Selat Pandjang must pass between Burung, an islet situated about 4½ miles north-eastward of Tanjong Padang Tikar, and the flats extending westward from Pandjang.

The bar off Selat Kubu kechil, which discharges nearly 2 miles north-eastward of Burung, and the directions for crossing it, are given with Inner Route IV. on page 186.

COAST.—The coast between Tanjong Burung and the entrance to Sungei Kapuas kechil (Kleine Kapoeas rivier), about 37 miles northward, is low, swampy and densely wooded. Inland there are a few prominent detached hills which, together with the mouths of the rivers, form the only landmarks.

Ambawang gebergte, about 14 miles north-north-eastward of Tanjong Burung, has three peaks of which the highest, Batu Wangkang, is 1,476 feet ($449^{m}9$) high.

Sungei Ambawang, one of the mouths of Sungei Kapuas (Groote Kapoeas rivier), is entered close northward of Tanjong Bunga (*Lat. 0° 21′ S., Long. 109° 07′ E.*), which lies about 14 miles north-north-westward of Tanjong Burung; its mouth is closed by a bar, and its lower reaches are shoal.

Charts 2160, 941a, 1263.

Chart 3721.

Between Tanjong Putus, about 4½ miles north-north-westward of Tanjong Bunga and Tanjong Saleh, about 14 miles north-north-eastward, the coast is fronted by several islands which form the delta of Sungei Pungur besar, a continuation of Sungei Kapuas (Groote Kapoeas rivier). The lower reaches of this river are too shoal to be of use for navigation.

The northern mouth of Sungei Pungur besar discharges immediately northward of Tanjong Saleh.

The whole of this coast is fronted by a mudbank, which can be safely approached by sounding, but in the vicinity of Tanjong Putus the 10-fathom (18^m3) line lies only 2 miles offshore.

For Sungei Kapuas kechil (Kleine Kapoeas rivier), Sungei Kapuas (Groote Kapoeas rivier) and the West coast of Borneo northward of the former, *see* China Sea Pilot, Vol. II.

INNER ROUTES TO PONTIANAK.—For small vessels with local knowledge there are four inner routes, through the delta of the Sungei Kapuas (Groote Kapoeas rivier), which lead to Pontianak, a town situated a few miles within the mouth of Sungei Kapuas kechil (Kleine Kapuas rivier) and described in China Sea Pilot, Volume II. Route I is entered from Bocht van Sukadana through the southern arm of Selat Maja; Route II is entered from Telok Nuri through the western arm of Selat Maja; Routes III and IV are both entered from the mouth of Selat Padang Tikar.

All these routes, except a portion of Route III, are navigable at night when conditions are favourable and with local knowledge. None of these inner routes permits vessels of deeper draught to reach Pontianak than is the case by the direct seaward route, and they are, therefore, only used by small coasting vessels wishing to avoid bad conditions of weather and sea. During the west monsoon considerably greater depths may be expected in the delta of the Sungei Kapuas (Groote Kapoeas rivier) than obtain at other seasons of the year. The latest information concerning the depths, silting, etc., can be obtained from the Harbour master at Pontianak.

The whole of the area of the delta of the Sungei Kapuas (Groote Kapuas rivier) is subject to heavy showers, squalls, and thick mist in the mornings; the view is thus often obstructed, and navigation may be impeded for some hours.

Charts 3758, 3721.

Inner Route I.—This route leads from Bocht van Sukadana (page 175) through the southern arm of Selat Maja, Selat Lida, Selat Padu Ampat, Selat Pandjang, Selat Kubu kechil, Selat Kubu, Sungei Pungur besar and thence into Sungei Kapuas kechil (Kleine Kapoeas rivier); this route is about 140 miles long and, except at neap tides, is available at high water for vessels not exceeding 10-foot (3^m0) draught.

The southern arm of Selat Maja has been described on page 177. The bar at the entrance to the southern arm of Selat Maja should be crossed on an 027° course as shown on the chart. When Pulau Kumbang, an islet about half a mile westward of the hill Kumbang (page 177), bears 002° it should be steered for until it is distant 4½ miles. Thence a 338° course should be steered, passing about 2¾ cables eastward of the beacon nearly one mile eastward of Tanjong

Charts 2160, 941a, 1263.

Charts 3758, 3721.
Turun (*Lat. 1° 08′ S., Long. 109° 47′ E.*), the western entrance point.

The directions for entering Selat Kubu kechil are given with Route IV on page 186. The breadth of this river varies between about a quarter and three-quarters of a cable, and that of Selat Kubu between about three-quarters and 1¼ cables, the beds of both rivers are soft mud, and banks extend from most of the points. A white beacon surmounted by a ball stands at the junction of Selat Kubu kechil, Selat Kubu and Sungei Ambawang.

There are whirlpools off Tanjong Olak Olak, where vessels turn sharply south-eastward into the Pungur besar, and a white beacon surmounted by a ball marks the extremity of a bank which extends from this point. Sungei Pungur besar has a breadth varying between about 1¾ and 4 cables between Tanjong Olak Olak and Suka Lanting, a small village situated at the junction of Sungei Kapuas (Groote Kapoeas rivier), Sungei Kapuas kechil (Kleine Kapoeas rivier) and Sungei Pungur besar, where Routes I to IV connect. A beacon, surmounted by a white ball, marks the eastern side of the junction of these rivers.

Inner Route II.—This route starts from Telok Nuri (page 182), through the western arm of Selat Maja, thence through Selat Lida, Selat Mendawak, Sungei Kapuas (Groote Kapoeas rivier), and Sungei Kapuas kechil (Kleine Kapoeas rivier). The total length of this route is about 170 miles, and vessels using it generally pass through the Inner route, eastward of Karimata, described on page 178.

A rock, which dries, lies in Selat Lida about 2½ miles above its junction with Selat Padu Ampat; its position is indicated by two warning boards on the northern bank, one above and the other below the rock. In 1949 the former warning board had disappeared.

Chart 3721.
A shoal, with a depth of 3 feet ($0^{m}9$) over it, lies about 3 miles above the junction of Selat Haur with Selat Lida. About 3½ miles farther up Selat Djenu connects with Selat Lida, and Route III connects with Route II; further details are given hereafter with the description of the former Route.

Inner Route III.—This route starts from the mouth of the Selat Padang Tikar (page 183), and vessels then proceed through Selat Pandjang, northward of Pulau Pandjang, to Selat Djenu besar. They can also reach the latter, and obtain greater depths, by passing through Selat Padang Tikar, southward of Pulau Pandjang, and thence westward of Telok Ajer, a high island situated off the eastern extremity of Pulau Pandjang. Kampong Telok Ajer (*Lat. 0° 44′ S., Long. 109° 34′ E.*), a Malay and Chinese settlement, is situated on the eastern side of the island, and there is a factory and pier here; a light, maintained privately, is exhibited from the pier. There is good anchorage off the village.

The route then passes through Selat Djenu besar, Selat Djenu, and Selat Lida, from which point it is the same as Route II, namely, through Selat Mendawak, Sungei Kapuas (Groote Kapoeas rivier) and Sungei Kapuas kechil (Kleine Kapoeas rivier); this route is about 144 miles in length.

About 2 miles above the mouth of Selat Djenu besar is a branch of the Kapuas delta which runs about 1½ miles in a north and south

Chart 3721.

direction, and on the eastern side of this branch is Batu, a hill 482 feet (146m9) high. Almost directly southward of this hill there is a bar in the Djenu besar with a depth of 6 feet (1m8).

About 3 miles above the junction of Selat Djenu and Selat Mendawak the latter becomes considerably narrower, and to obtain a depth of 10 feet (3m0) here the right bank must be held. Selat Mendawak connects with Sungei Kapuas (Groote Kapoeas rivier) off the south-eastern extremity of Djambu, from which a sandbank extends about 2 cables; the bed of the Sungei Kapuas (Groote Kapoeas rivier) consists here of soft mud, and the banks are hard sand. There are depths of 10 feet (3m0) in the branch of the river southward of Djambu; the passage eastward and northward of this island is easier to navigate, but the first portion is shoaler.

During September Route III only presents difficulties for a vessel with a draught of 8 feet (2m4) in the channel southward of Djambu; during the dry season, May to September, there is probably insufficient depth everywhere in that portion of the route. In the channel southward of Djambu larger vessels are recommended to employ a motor boat sounding ahead; such vessels can only navigate Selat Djenu and Selat Mendawak by day. In numerous places fixed tree trunks may be found in the channel, which sometimes makes it difficult to round the bends. The south-eastern bank of the Sungei Kapuas (Groote Kapoeas rivier) must be held when passing the small bank in the middle of the river about 8¾ miles eastward of Suka Lanting (*Lat. 0° 19′ S., Long. 109° 35′ E.*). When past Suka Lanting the difficulties have been overcome, although the sharp bends at Tanjong Selebes, about one mile above Suka Lanting, and at the village of Telok Kumpai, about 13½ miles north-westward of Suka Lanting, require especial care; just below this village the forest ceases, and paddy fields and shrubs are seen.

Inner Route IV.—This route is entered from the mouth of the Selat Padang Tikar, and then leads through Selat Kubu kechil, whence it is the same as Route I. It is a good channel for vessels with a draught of 10 feet (3m0), as the bar off the entrance to Selat Kubu kechil is the shoalest part of the entire route. This bar consists of mud and sand, and has a least depth of 4 feet (1m2) in the channel. There is a beacon, consisting of a white cross fitted with a reflector, on the eastern side of the entrance to Selat Kubu kechil, marking the seaward end of a stone dam, which extends in a north-north-westerly direction to the shore. A black barrel buoy is moored about one mile south-south-eastward of this beacon. A vessel entering the river should pass close eastward of the barrel buoy and steer for the middle of the mouth of the Selat Kubu kechil.

Should the above-mentioned beacon not be sighted, due to low visibility, the river mouth can be approached with the western extremity of the south-western Pandjang island in line, astern, with the eastern peak of Maja gebergte (*Lat. 1° 04′ S., Long. 109° 31′ E.*) (page 177), bearing 159°.

Within the entrance the western bank should be held at the first and third bends, which are to starboard; the second bend, which is to port, presents no difficulty. Farther in a mid-channel course should be held.

The remainder of this route is described with Inner Route I on pages 184-185.

Charts 2160, 941a, 1263.

CHAPTER VIII

RIOUW AND LINGGA ARCHIPELS.—OUTER ROUTE TO SINGAPORE.—STRAAT RIOUW.—PASSAGES LEADING BETWEEN THE OUTER AND INNER ROUTES

Chart 2757.

RIOUW AND LINGGA ARCHIPELS.—These archipelagoes comprise a great number of islands and islets, with numerous reefs around, lying off the Sumatra coast between Tanjong Djabung (*Lat. 1° 01′ S., Long. 104° 22′ E.*) (page 110) and Singapore. Lingga archipel, which is the southern of the two, comprises the large islands Singkep and Lingga, as well as many smaller islands and off-lying reefs. Riouw archipel comprises the large islands Bintan and Batam, between which is Straat Riouw, as well as a number of lesser islands. Owing to coral growth and silting these islands are subject to considerable, but gradual, alteration ; in less frequented channels, especially, mariners should, therefore, pay attention to the date of the chart in use.

Many of the straits between the various islands are navigable, but vessels passing through the archipelago from Straat Banka to Singapore usually take one of the following routes :—

A. Eastward of Lingga archipel and thence through Straat Riouw. The eastern side of Lingga archipel is described on pages 188-190 ; Straat Riouw is described on pages 198-213.

B. Eastward of Lingga archipel and thence through Straat Temiang (page 224) and Straat Durian (page 252).

C. Through Straat Berhala (page 231), westward of Lingga archipel (page 232), and through Straat Durian (page 252).

D. Through Straat Berhala and westward of Lingga Archipel as in Route " C " ; thence through Straat Pengelap (page 226) and Straat Riouw (page 198), or through Straat Abang (page 227), Straat Dempo (page 228), and Straat Bulan (page 273).

There is also an outer route, which leads eastward of Riouw and Lingga Archipel and into the eastern part of Singapore strait, *see* Directions on page 193.

Low-powered vessels proceeding between Straat Banka and Singapore in December, January and February are recommended to take Route " D " in preference to Route " A " or the outer route ; on Route " D " there is calm water and vessels have the opportunity of obtaining temporary anchorage in various places. During the remainder of the year any route may be taken.

Health.—Riouw and Lingga archipels are unhealthy on account of malaria. The heat by day is accentuated by the rocky and sandy nature of the land ; the nights are generally cool, with a heavy dew.

Charts 1355, 2660a, 941a, 1263.

Chart 2757.

Tidal streams.—In the southern part of Riouw and Lingga archipels, and also in the South China sea, the diurnal tide predominates, whilst in the northern part of the Sumatra side the semi-diurnal tide predominates; the tidal streams similarly become more diurnal to the south and east of the archipelagoes. In general the tidal streams set towards Amphitrite baai, through the various channels between the islands of the archipelagoes while the tide is rising there and set outwards from it while the tide is falling there. Further details, where known, will be found in the appropriate places in the description of these straits.

Chart 1789.

EASTERN SIDE OF LINGGA ARCHIPEL.—The eastern side of Lingga archipel, in so far as it affects vessels proceeding by any of the routes eastward of this archipelago, will be described first; the description of the remainder of this archipelago, for local navigation, is given on pages 213-228.

The Tudju eilanden, as well as Dokan and Toty, which are useful landmarks for any of these routes, have been described in Chapter V, pages 115-117.

Islets and dangers eastward of Singkep.—Saja (Saya), about 26½ miles east-south-eastward of Tanjong Malang (*Lat. 0° 39′ S., Long. 104° 30′ E.*), the south-eastern extremity of Singkep, is a steep islet with two peaks, the southern and higher being 686 feet ($209^{m}1$) high. The Njamuk (Niamok) eilanden are two steep granite rocks lying about three-quarters and half a mile north-eastward of Saja; a rock awash lies about midway between these two islets.

Castor bank is a narrow ridge of hard sand, with a least depth of 6 fathoms ($11^{m}0$), extending about 9 miles in a north-north-easterly direction from a position about 6 miles north-eastward of Saja. Cowmans bank, with a least depth of 6 fathoms ($11^{m}0$) over it, is about 6 miles west-north-westward of Castor bank and runs parallel to it.

Ilchester bank, known locally as Alang Kalem, with a least depth of 1½ fathoms ($2^{m}7$), lies with its shoalest part about 8½ miles south-south-westward of Tanjong Djang (Jang), the eastern extremity of Lingga; the north-western side of this bank is steep-to. A bank, with a least depth of 5 fathoms ($9^{m}1$), is situated close southward of Ilchester bank with its shoalest part about 12½ miles south-south-westward of Tanjong Djang. The light on Tanjong Djang is obscured over this bank and also over the western part of Ilchester bank.

Tanjong Djang.—Light.—Tanjong Djang (Jang) is a steep, rocky point, visible from a distance of about 30 miles. Merati is an islet lying about one mile eastward of this point, with a group of rocks, always above water, about midway between. Sunsa, an islet close southward of Tanjong Djang, has a prominent hill on it, 325 feet ($99^{m}1$) high. A rock, with a depth of 1¼ fathoms ($2^{m}3$) over it, lies about half a mile south-eastward of Sunsa.

A light is exhibited, at an elevation of 182 feet ($55^{m}5$), from a white iron framework structure, 33 feet ($10^{m}1$) in height, on Tanjong Djang (*Lat. 0° 18′ S., Long. 105° 00′ E.*).

Gunung Daik (Lingga peak), *see* page 217, situated in the western part of Lingga and the summit of that island, and Sepintjan (Sepinchan),

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

see page 217, situated about 2¾ miles north-eastward of Gunung Daik, are useful landmarks; *see* view facing page 200.

Islands and dangers off the north-eastern side of Lingga.—Light.—Selentang, known locally as Pulau Semut, about 11 miles northward of the light-structure on Tanjong Djang, is a sandy islet, 80 feet (24^{m}4) high, covered with high trees; it is surrounded by a reef, which extends as much as three-quarters of a mile from its northern side. Malang Kri, two rocks with depths of 5 feet (1^{m}5) and 1¾ fathoms (3^{m}2) over them, lie, respectively, about 3 cables south-westward and one mile southward of Selentang.

Budjang (Bujang), nearly 5 miles west-south-westward of Selentang, is a hilly island covered with coconut trees; Bulu is a small village on the southern side of the island.

Kongka besar lies with Tanjong Maran, its south-eastern extremity, about 3½ miles north-westward of Budjang, and Kongka kechil is close off its western side; both islands are hilly, the latter being the higher and rising to a height of 374 feet (114^{m}0). Blading is situated about one mile north-north-westward of the northern extremity of Kongka besar. Two above-water rocks lie within a distance of three-quarters of a mile north-westward from Blading; for other dangers in the vicinity, *see* page 220.

Pulau Krokodil (Crocodile rock), about 3¼ miles east-north-eastward of Blading, is about 15 feet (4^{m}6) high, and is prominent; a large reef, marked by discoloration, lies about half a mile westward of this rock. There are several shoals, with depths of from 3¼ to 5 fathoms (5^{m}9 to 9^{m}1), in the vicinity, the easternmost having a least depth of 5 fathoms (9^{m}1) and lying about half a mile northward of Pulau Krokodil.

Kentar lies with its south-eastern extremity about 3¾ miles north-westward of Blading and is hilly almost throughout; there is a prominent plateau, 390 feet (118^{m}9) high, on its south-eastern extremity. Anak Langu, a rock above water, is about 6 cables southward of the south-eastern point of the island.

A light is exhibited, at an elevation of 393 feet (119^{m}8), from a white iron framework structure, 105 feet (32^{m}0) in height, situated on the plateau on the south-eastern extremity of Kentar (*Lat. 0° 02′ N., Long. 104° 47′ E.*).

Bakau, Tjandur (Chandur), and Beringin lie on a reef northward of Kentar, the last mentioned islet being situated about 3¼ miles northward of the north-western point of Kentar. A shoal, with a depth of 1¾ fathoms (3^{m}2) over it, lies in mid-channel between Bakau and Kentar. A shoal, with a depth of 2 fathoms (3^{m}7) over it, is situated about 2¾ miles eastward of the north-eastern extremity of Bakau. There is a reef, which dries, about three-quarters of a mile westward of Beringin. Kapas is a rocky islet, 2 feet (0^{m}6) high, lying on the northern end of a reef and nearly 2½ miles north-westward of Beringin; a 4½-fathom (8^{m}2) patch lies about one mile south-eastward of Kapas. Karang Busung is about one mile north-westward of Kapas, with a 1¾-fathom (3^{m}2) patch between.

Pollux rock, with a depth of 2 feet (0^{m}6) over it, is situated about 5 miles north-eastward of Beringin and is in a very dangerous position for shipping; sounding gives no indication of a vessel's approach to this rock, and it is not easily discerned.

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 1789.

Sebangka lies with its south-eastern extremity about 1½ miles westward of Kentar, and the hills on it are prominent to vessels proceeding eastward of Lingga archipel; the summit of the island, 509 feet ($155^{m}1$) high, is situated in about the middle. The north-eastern coast can be approached fairly closely, and there is good holding ground, in depths of from 6 to 7 fathoms ($11^{m}0$ to $12^{m}8$), within a distance of from 3 to 5 miles off this coast. Three reefs, with sandbanks which dry on them and which are plainly marked by discoloration at high water, lie in the channel between the south-eastern extremity of Sebangka and the islands Kentar and Bakau, and between 1½ and 2½ miles west-north-westward of the north-western extremity of Bakau; there is a 2¼-fathom ($4^{m}1$) shoal about half a mile west-north-westward of the northern reef. A 2¼-fathom ($4^{m}1$) patch lies about half a mile offshore and 2½ miles east-south-eastward of the north-eastern extremity of Sebangka, and there is a 4¾-fathom ($8^{m}7$) patch (chart 2413) about 1½ miles north-eastward of the same point. The inshore passage between Sebangka and Bakung, about 5 miles south-westward, is described on page 221.

Straat Temiang and Straat Merodong are described on pages 224-226.

Chart 2757.

EASTERN SIDE OF RIOUW ARCHIPEL.—Bintan.—Light.— The eastern side of Bintan is rendered unsafe up to a distance of about 20 miles by a number of islands, banks, reefs and rocks; with local knowledge it is possible to make use of some of the passages between these dangers, but otherwise it is advisable to pass outside them.

The few peaks on Bintan which can be identified from a distance are: Kuas, a conical hill with a blunt top, 760 feet ($231^{m}6$) high, situated about 3¾ miles northward of Tanjong Tili (chart 2413), the south-eastern extremity of the island. Kidjang, a group of hills near the coast north-eastward of Kuas (*Lat. 0° 52′ N., Long. 104° 35′ E.*), of which the southern, 724 feet ($220^{m}7$) high, is the highest. Gunung Bintan besar (Groote Bintan) and Gunung Bintan kechil (Kleine Bintan), 1,213 and 777 feet ($369^{m}7$ and $236^{m}8$) high, respectively, situated in the middle of the northern part of the island and about 12 and 10 miles, respectively, south-westward of Tanjong Berakit, *see* below, are prominent when vessels are making for the eastern entrance of Singapore strait. *See* view facing page 200.

Chart 3834.

Tanjong Berakit, the north-eastern extremity of Bintan, is a noticeable headland on which are some hills, the highest, with a height of 289 feet ($88^{m}1$), lying nearly 2 miles southward of the point; there are some trees on the point.

The point is fringed by a reef which extends three-quarters of a mile northward and half a mile westward; on the reef are Berakit, an islet about 40 feet ($12^{m}2$) high to the tops of the trees, and Black rock, above water. The dangers off Tanjong Berakit are described in the Malacca Strait Pilot.

A light is exhibited, at an elevation of 219 feet ($66^{m}7$), from a white iron framework structure, 98 feet ($29^{m}9$) in height, on the north-eastern side of Tanjong Berakit.

Chart 2757.

Off-lying islands and dangers eastward of Bintan.—Only those

Chart 2757.

islands and dangers which lie near the outer route to Singapore strait are described here; the islands, and various straits between them, which lie near the south-eastern extremity of Bintan, are described on pages 194-198; and those westward of Mapor (page 192) on pages 193-194.

Admiraal Stellingwerf rif (*Lat. 0° 38′ N., Long. 105° 09′ E.*), the outermost danger off the eastern side of Bintan, lies nearly 35 miles east-south-eastward of Tanjong Tili, and is a steep-to rock with a depth of 1½ feet ($0^{m}5$) over it. In calm weather this reef is marked by discoloration, but at other times, except with a tolerably smooth sea and with wind and stream in contrary directions, it is difficult to distinguish between the breakers on the reef and the crests of the waves in the greater depths in the vicinity. Vessels will be well clear eastward of this danger if they keep in depths of not less than 25 fathoms ($45^{m}7$); if Kuas is visible, as well as Gin besar (page 194) and Beruan (*see* below), so that bearings of them can be taken, vessels will know that they are clear westward of this danger.

A narrow bank, with depths of from 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$) over it, which extends about 35 miles in a general north-easterly direction from Mesanak, an island situated about 7 miles northward of the northern extremity of Sebangka, deserves particular attention, as it is an excellent guide for a vessel determining her position by sounding, especially in thick weather; a vessel on the north-eastern end of this bank will be about 9 miles north-westward of Admiraal Stellingwerf rif and about 5 miles south-eastward of Geldria.

Geldria, with a least depth of 3 fathoms ($5^{m}5$) over it, is the north-eastern of a number of banks which extend about 10 miles south-westward from a position about 22 miles eastward of Tanjong Tili. Raleigh bank, about 4 miles south-westward of the shoalest part of Geldria, is one of these banks and has a least depth of 3¾ fathoms ($6^{m}9$) over it. Banks with depths of 3¼, 5½ and 3¾ fathoms ($5^{m}9$, $10^{m}1$ and $6^{m}9$) over them, lie, respectively, about 1½ miles north-eastward, 1¾ miles south-south-westward and 3 miles south-westward of Raleigh bank. There are deep passages between these banks, but vessels should pass well clear eastward of them.

Beruan is a saddle-shaped island, 291 feet ($88^{m}7$) high, lying about 13 miles eastward of Tanjong Tili. There are several islets and dangers southward and south-westward of Beruan. Teroti, the southernmost islet, 112 feet ($34^{m}1$) high, lies about 5 miles south-south-westward of Beruan. Binjoso is about one mile north-north-westward of Teroti and there are several islets and reefs in the vicinity. Rooderots lies on a reef about 2¼ miles southward of Beruan. Mas, 131 feet ($39^{m}9$) high, is about 2 miles south-south-westward of Beruan and the reef on which it lies extends for about half a mile north-westward and south-westward. Two drying reefs lie about one mile south-westward and west-south-westward, respectively, of Beruan (*Lat. 0° 47′ N., Long. 104° 49′ E.*).

Kaju Ara, about 7¾ miles east-north-eastward of Beruan, consists of three rocks above water lying on a reef; a 5½-fathom ($10^{m}1$) patch lies about 6 cables south-eastward of them, and there are irregular depths around.

Merapas is a wooded islet, 301 feet ($91^{m}7$) high, situated nearly 6 miles northward of Kaju Ara.

Charts 3543, 1355, 2660a, 941a, 1263.

Chart 2757.

Mapor lies with its eastern extremity about 4½ miles north-westward of Merapas, and has a prominent hill, 351 feet (107^{m}0) high, on its north-western point. Except for a sandy beach about a mile in length, forming a good landing place, situated on the northern coast eastward of the prominent hill, the island is surrounded by a reef. Several rocks, some of which are covered with vegetation, lie within a distance of 1¾ miles off the south-eastern coast; the passage between the outermost of these rocks and Merapas is clear. Sentut, an islet in the form of a sugarloaf, 140 feet (42^{m}7) high, is about 2½ miles north-westward of the north-eastern point of Mapor, and the channel between is foul; there are several islets lying within a distance of half a mile from the northern coast of Mapor. Melibon, about 6 cables north-westward of the north-western point of Mapor, is an islet in the shape of a pyramid and is 85 feet (25^{m}9) high. A reef, with a depth of 1½ fathoms (2^{m}7) over it, lies about 2 miles northward of Melibon; there is a rock above water about 2½ miles west-north-westward of this reef.

Several islets lie off the eastern coast of Bintan, north-westward of Mapor; the most prominent of these is Nikoi, 197 feet (60^{m}0) high, which lies about 4 miles west-north-westward of Melibon and is covered with high trees. The islets of Beralas besar and Beralas bukit are on a large drying reef about 2 miles westward and west-north-westward, respectively, of Nikoi; the former is covered with coconut palms. Above-water rocks are situated about 8 cables south-south-westward, 5 and 9 cables westward, and 1¾ miles north-north-westward of Nikoi. Two patches of stone, with depths of 1¼ fathoms (2^{m}3) and 3 feet (0^{m}9) over them, lie, respectively, about three-quarters of a mile north-north-westward and 1½ miles northward of Nikoi.

Tanjong Bakau is situated nearly 3½ miles westward of Nikoi; there is a hillock about 2½ miles west-south-westward of the point.

The islet of Berlangkap lies nearly 4½ miles north-westward of Nikoi; there are several above-water and sunken rocks within a distance of half a mile eastward and southward of Berlangkap. Tanjong Berlangkap is situated about 1½ miles westward of Berlangkap; the coastal reef extends about half a mile offshore in this vicinity, and two drying patches, with above-water rocks on them, lie about three-quarters of a mile north-north-eastward and 1¼ miles northward of the point. A hill, 358 feet (109^{m}1) high, is situated about 2¾ miles west-north-westward of Tanjong Berlangkap (*Lat. 1° 06′ N., Long. 104° 38′ E.*).

Charts 2403, 2757.

Tanjong Lokam lies nearly 7 miles north-north-westward of Tanjong Berlangkap. The coast between Tanjong Berlangkap and Tanjong Lokam is fringed by a reef extending about 3½ cables offshore.

Chart 2757.

Currents and tidal streams.—In the open sea, eastward of Lingga archipel, during December, January and February, there is a current running southward at a rate which may attain 3 knots during strong northerly and north-easterly winds but is normally about one knot; vessels are, therefore, liable to be set in off Kentar and Kongkar besar. During June, July and August the monsoon current usually sets northward at one to 1½ knots.

Off the eastern side of Lingga archipel the tidal streams set north-north-eastward and south-south-westward. Near Admiraal Stelling-

Charts 3543, 1355, 2660a, 941a, 1263.

Chart 2757.

werf rif (*Lat. 0° 38′ N., Long. 105° 09′ E.*) they set northward and southward. Under the coast of Bintan the tidal streams set between south and west, and between north and east; a rate of 3 knots has been observed.

Directions for the outer route.—Vessels proceeding eastward of Riouw archipel, instead of through Straat Riouw (*see* Directions on page 211), from a position eastward of Saja (page 188) can steer a northerly course so as to pass eastward of Admiraal Stellingwerf rif, crossing the equator in depths of about 20 fathoms ($36^{m}6$). At night it is advisable to keep in depths of not less than 23 or 24 fathoms ($42^{m}1$ or $43^{m}9$) when between lat. 0° 30′ N. and lat. 0° 50′ N. Merapas bearing 315°, or less, leads north-eastward of Admiraal Stellingwerf rif and Geldria.

ISLANDS AND DANGERS OFF THE EASTERN COAST OF BINTAN WESTWARD OF MAPOR.—Beruan and the islets and dangers in its vicinity have been described on page 191; Gin besar and the dangers off its eastern and northern sides are described on page 194. The channels between Mapor and the eastern coast of Bintan are available only for vessels with local knowledge.

The islet of Murbai is about 6 miles southward of the north-western extremity of Mapor; two 4¾-fathom ($8^{m}7$) patches lie about 3½ miles east-south-eastward and 2¾ miles south-eastward of Murbai. A narrow bank of sand and stones extends north-westward for nearly 3 miles from a position about one mile north-eastward of Murbai; a least depth of 1½ fathoms ($2^{m}7$) exists on this bank about 2¼ miles northward of Murbai. The islet of Putang is situated about 1¼ miles west-south-westward of Murbai and a drying reef lies about 1½ miles southward of Putang.

Pangkil besar, about 2¼ miles westward of Murbai, is fringed by a drying reef; a hill, 202 feet ($61^{m}6$) high, is situated about one mile northward of its south-eastern extremity. Depths of less than 3 fathoms ($5^{m}5$) extend for nearly 1¼ miles southward from its southern side and a drying reef lies about 1½ miles south-south-westward of its south-eastern extremity. A bank, with a least depth of 2 fathoms ($3^{m}7$) over it, is situated about 1¾ miles south-south-eastward of the south-eastern extremity of Pangkil besar, and depths of less than 5 fathoms ($9^{m}1$) extend for about one mile northward and southward from its shoalest part.

Pangkil kechil, 131 feet ($39^{m}9$) high, is situated about 1¼ miles west-south-westward of Pangkil besar; there are drying patches about 1½ miles south-south-eastward and 4 cables southward of this islet. Two 5-fathom ($9^{m}1$) patches lie about 7 cables eastward and 4 cables westward of the northern extremity of Pangkil kechil (*Lat. 0° 55′ N., Long. 104° 43′ E.*).

The islets of Gego and Tjepedak, the latter being 174 feet ($53^{m}0$) high, are situated about 2½ and 4½ miles, respectively, southward of Pangkil kechil, and a drying reef, Terumbu Taong, lies with its northern end about one mile south-south-eastward of Gego; between the above reef and the island of Poto, about 1¼ miles westward, it is foul.

Foul ground, with some above-water rocks, extends for nearly 1¾ miles northward and one mile north-eastward from the northern

Charts 1355, 2660a, 941a, 1263.

Chart 2757.

end of Poto; the islets of Terumbu Gareng and Antu are about one mile northward and north-north-westward, respectively, of the north-western extremity of Poto. The northern entrances to Straat Poto and Straat Kidjang (page 197) lie southward and south-westward, respectively, of Antu; they are shoal and used only by small local craft so will not be described.

Mantjin besar and Mantjin kechil are two islets lying on the coastal reef about 2¼ miles and 2½ miles, respectively, northward of Antu.

The islet of Tjengom, on the north-eastern end of a large drying patch, is situated about 3½ miles north-westward of the northern end of Pangkil besar; a rock awash lies about 9 cables northward of Tjengom. Malang Tinggiri is about 8 cables south-eastward of Tjengom, and depths of less than 3 fathoms ($5^{m}5$) extend for about 2¼ miles northward and 1¼ miles south-south-westward of Malang Tinggiri; there is a drying patch near the southern end of this shoal water. Another drying patch, with some above-water rocks on it, lies about 1½ miles south-eastward of Tjengom.

Sama, consisting of two islets, close together, and 50 feet ($15^{m}2$) in height, is about 3½ miles west-south-westward of the north-western extremity of Mapor (page 192); a bank of sand, with a least depth of 2¾ fathoms ($5^{m}0$), lies with its shoalest part about one mile north-north-westward of Sama. Depths of less than 5 fathoms ($9^{m}1$) extend about 1¾ miles northward and three-quarters of a mile southward from its shoalest part. Two other banks, with depths of 3¼ and 3¾ fathoms ($5^{m}9$ and $6^{m}9$) over them, lie, respectively, about one mile and 1¾ miles westward of this sandbank, the former being an extension southward of the shoal water off Nikoi (page 192). There is deep water between Sama (*Lat. 1° 00′ N., Long. 104° 44′ E.*) and Mapor with the exception of a rock awash about one mile south-south-westward of the north-western extremity of Mapor, and a drying reef about 2 miles southward of the same point; the coastal reef extends up to one mile off the north-western coast of Mapor.

ISLANDS OFF THE SOUTH-EASTERN EXTREMITY OF BINTAN.—Light.—Beacon.—Gin besar lies with its eastern extremity about 10½ miles east-south-eastward of Tanjong Tili, and close off its southern side are Gin kechil and Numbing; all three islands are hilly, Gin besar and Numbing having hills on them 288 and 229 feet ($87^{m}8$ and $69^{m}8$) high, respectively. The strait between Gin kechil and Numbing is only navigable by small craft, and that between these two islands and Gin besar is obstructed by reefs at each entrance. The passage between these islands and Beruan should not be attempted without local knowledge.

A group of above-water and sunken rocks lie within a distance of one mile south-eastward and eastward of the south-eastern extremity of Numbing. Witterots, a reef with two above-water rocks on it, is eastward of Gin besar and about 2½ miles south-westward of Beruan (page 191); another drying reef lies about half a mile westward of Witterots and there are some shoal patches between it and the north-eastern extremity of Numbing. Suka, an islet 110 feet ($33^{m}5$) high, is situated nearly 2 miles north-eastward of the north-eastern extremity of Gin besar; there are two 5½-fathom ($10^{m}1$) patches about one mile east-south-eastward and southward, respectively, of Suka. Borus is

Charts 3543, 1355, 2660a, 941a, 1263.

Chart 2757.

an islet close off the north-eastern extremity of Gin besar; a 1½-fathom ($2^{m}7$) patch lies about three-quarters of a mile westward of Borus. The islet of Lima is situated close northward of the north-western extremity of Gin besar and about 2½ miles westward of Borus; a rock awash lies about 4 cables north-north-eastward of Lima.

Telang besar, 232 feet ($70^{m}7$) high, lies with its north-eastern extremity about 2 miles westward of Gin kechil. Telang kechil, the southern part of this island, has a prominent hill on it, 259 feet ($78^{m}9$) high. Straat Sendara, between Telang and Gin kechil, is difficult to navigate owing to the strong tidal streams and as there are two banks, with depths of less than 2 fathoms ($3^{m}7$), and some reefs which dry, on the western side of the strait; there is a similar bank on the eastern side, and two reefs, which dry, lie about half a mile southward of Gin kechil (*Lat. 0° 45′ N., Long. 104° 42′ E.*).

The islet of Rinti is on the north-eastern side of the northern entrance to Straat Sendara and about 1½ miles north-eastward of the north-eastern extremity of Telang besar; a rock awash lies about half a mile southward of Rinti and there is a drying reef, with an above-water rock on it, about 3 cables northward of the same islet. A rock awash lies on the western side of the northern entrance to Straat Sendara about 6 cables northward of the north-eastern extremity of Telang besar.

Charts 2413, 2757.

Hendrik Jan rif, with a depth of 2 fathoms ($3^{m}7$) over it, is situated about 6 cables south-eastward of the south-eastern extremity of Telang kechil. A 4½-fathom ($8^{m}2$) patch lies about 3 cables westward of Hendrik Jan rif.

Siulung is a hilly island lying with its north-eastern extremity about 2½ miles north-westward of the north-eastern extremity of Telang besar; there is a prominent hill, 460 feet ($140^{m}2$) high, on its south-western extremity, which appears conical when seen from southward and flat when seen from eastward. Straat Telang, between Siulung and Telang, is difficult to navigate as there are several reefs in it. Serai, an inhabited islet 62 feet ($18^{m}9$) high, lies close off the southern extremity of Siulung, and Thomas shoal, with a least depth of 2 fathoms ($3^{m}7$), is about three-quarters of a mile west-south-westward of Serai (*Lat. 0° 45′ N., Long. 104° 35′ E.*).

A patch of drying reefs lies about one mile north-westward of the north-eastern extremity of Telang besar and foul ground extends about 1¼ miles south-westward from these reefs. The islet of Kambat is situated nearly 3 miles north-north-eastward of the north-eastern extremity of Telang besar, and a drying reef, marked by a beacon, lies about three-quarters of a mile south-westward of Kambat.

Chart 2413.

Mantang is separated from the western side of Siulung by Straat Mara Limau, a narrow passage only navigable for small craft, as the southern entrance is shoal; except for a prominent hill, 267 feet ($81^{m}4$) high, on Tanjong Punggung, the south-western extremity of Mantang, this island is low and flat. The villages Baru, Mantang and Riouw are situated on the northern coast.

A light is exhibited, at an elevation of 200 feet ($61^{m}0$), from a white iron framework structure, 43 feet ($13^{m}1$) in height, situated on the hill on Tanjong Punggung.

Chart 2413.

Channel northward of Mantang and Siulung.—Islets and dangers.—Buoys.—There is a channel northward of Mantang and Siulung, which can be used by vessels with local knowledge bound for Straat Kidjang from Straat Riouw.

Several islets and dangers lie off the western side of Mantang, in the south-western approach to this channel. A rock, with a depth of 3¾ fathoms ($6^{m}9$) over it, is situated about 1½ miles south-westward of Tanjong Punggung. Ranggas is a thickly wooded islet, 162 feet ($49^{m}4$) high, lying about 1½ miles west-north-westward of Tanjong Punggung, and from a distance bears some resemblance to the hill on that point. A reef, which dries, lies nearly one mile northward of Ranggas. A white conical buoy, surmounted by a ball, is moored about 1¼ miles north-westward of Ranggas and between this buoy and the Tapai eilanden (page 201) there is a channel with a least depth of 4¼ fathoms ($7^{m}8$) in the fairway.

Belading (*Lat. 0° 48′ N., Long. 104° 29′ E.*) is a wooded islet, with a prominent white sandy beach near its northern extremity, surrounded by a reef, lying on the southern side of the western entrance to the channel northward of Mantang and about 2¼ miles northward of Ranggas. A white conical buoy surmounted by a ball is moored about a quarter of a mile north-north-westward of Belading. A 2¾-fathom ($5^{m}0$) patch lies about three-quarters of a mile southward of Belading, and there is a reef, which covers at half tide, about 3 cables eastward of the same islet. On the northern side of the entrance are Malang Berdaun and Karang Pasir, which lie on the edge of the coastal bank which extends nearly one mile from the Bintan coast at Tanjong Motjoh, situated about 2½ miles north-north-eastward of Belading.

Dendang and Antu are two wooded islets lying about one and 2½ miles, respectively, eastward of Belading and on the southern side of the channel. A shoal, with a depth of 5 fathoms ($9^{m}1$), marked by a white mooring buoy on its north-western side, lies about 2½ cables west-north-westward of Antu, and another shoal, with a depth of 4 fathoms ($7^{m}3$) over it, is about 8 cables eastward of this islet; a white conical buoy, surmounted by a ball, is moored off the northern side of the latter shoal. A drying reef lies about three-quarters of a mile south-westward of Dendang. Between the north-western coast of Mantang and the islets of Ranggas, Dendang and Antu there are many reefs and shoal patches. The islets of Bakau and Alang are situated about three-quarters of a mile south-south-eastward and south-eastward, respectively, of Dendang. Kekip and Bunut lie close off the eastern part of the northern coast of Mantang.

A rock, which dries, and a 2-fathom ($3^{m}7$) patch lie close off the Bintan coast northward of Bunut and within one mile westward of Tanjong Tili (page 190); a 3¾-fathom ($6^{m}9$) patch and a 2¼-fathom ($4^{m}1$) patch are situated about 2 cables south-westward and 1½ cables southward, respectively, of Tanjong Tili (*Lat. 0° 49′ N., Long. 104° 36′ E.*).

The islets of Bulat, Adjap, Ngalih, and Riouw lie on the southern side of the channel within a distance of 1¾ miles west-north-westward of the north-eastern extremity of Siulung; the channel between the northern coast of Siulung and the islets of Adjap, Ngalih and Riouw is clear, with depths of about 6½ fathoms ($11^{m}9$).

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2413, 2757.

There is a channel, marked by beacons, which leads into Straat Kidjang from eastward of Siulung, passing northward of the two drying reefs lying about 4 cables northward and north-westward of Kambat (page 195) ; thence northward of Rusa kechil and Rusa besar, lying, respectively, about one mile and half a mile eastward of the north-eastern extremity of Siulung, and southward of the islet of Gabi, situated about half a mile north-eastward of the same point. This route is not recommended as the channel from Kambat to beyond Merapas (page 191) has not been examined since 1898.

Chart 2413.

Straat Kidjang.—Dangers.—Beacons.—Buoys.—Straat Kidjang is the narrow strait between the southern part of the eastern coast of Bintan and the islands Kojan, Angkut, Dendang and Buton, lying with their south-western extremities about half a mile, 2 miles, 2½ miles and 3¼ miles, respectively, northward of Bulat. The southern entrance, between Tanjong Tili and the southern extremity of Kojan, is obstructed by shoals, but there is a channel on the western side, marked by two leading beacons situated on the western side of Kojan, about 1¾ miles north-eastward of Tanjong Tili. The front beacon is surmounted by a triangle, point up, and the rear beacon, which stands 82 feet ($25^{m}0$) distant from the front beacon, is surmounted by a triangle, point down. The beacons are in line bearing 043° and, in 1948, there was a least depth of 18 feet ($5^{m}5$) on the leading line. The entrance to the channel is marked by a black can and a white conical buoy, moored, respectively, close north-westward and south-eastward of the leading line, about 3 cables south-eastward of Tanjong Tili. Just within the entrance, and about half a mile north-eastward of Tanjong Tili, is a shoal with a least depth of 1½ fathoms ($2^{m}7$), marked by a beacon, on which is a tide gauge.

There may be a strong stream off Tanjong Tili setting across the channel from the southern entrance of the strait. A rate of 3½ knots has been observed.

A shoal, with a depth of 1½ fathoms ($2^{m}7$), extends from the western side of the strait and about one mile north-eastward of Tanjong Tili. Mana is an island situated in the middle of the strait and about 2½ miles within the southern entrance. There are depths of 3 and 1¾ fathoms ($5^{m}5$ and $3^{m}2$) about 1½ cables northward and 2½ cables north-north-eastward, respectively, of the northern extremity of Mana. Vessels proceeding through Straat Kidjang pass eastward of the black buoys and beacon, and westward of the white buoys.

Vessels up to a length of 400 feet ($121^{m}9$) and a draught of 25 feet ($7^{m}6$) can lie alongside a pier at Sungai Kolak (*Lat. 0° 51′ N., Long. 104° 37′ E.*), situated on the western side of the strait and about half a mile southward of Mana ; two mooring buoys, privately maintained, are moored off this pier. Vessels exceeding a gross capacity of 750 cubic metres, bound for Sungai Kolak, must employ a pilot at Rede Tandjung Pinang (page 209), and the Harbour master there must be notified at least 24 hours beforehand; there is no pilotage at night.

Overhead cables are laid across Straat Kidjang nearly half a mile southward of Sungai Kolak and also across the western entrance of Straat Angkut, about 3 miles south-eastward of the same village ; the former are 148 feet ($45^{m}1$) above highest water level, and the latter 66 feet ($20^{m}1$) above highest water level.

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

The following tidal signals are displayed at the pier at Sungai Kolak by day :—

Tidal stream flowing in : a cylinder, with a cone, point upwards, above it.

Tidal stream flowing out : a cylinder, with a cone, point downwards, below it.

Slack water : a cylinder, with a cone, point upwards, above it and a cone, point downwards, below it.

Charts 2413, 2757.

Straat Dendang and Straat Kelong.—Leading beacons.—Buoys.—The northern entrance to Straat Kidjang is very shoal, so that this passage can be used only by small vessels with local knowledge for communication between Straat Riouw and the eastern coast of Bintan.

Vessels leaving Sungai Kolak proceed, under pilot's directions, along the route westward and northward of Mana (*Lat. 0° 51′ N., Long. 104° 37′ E.*) ; thence through a channel, marked by leading beacons and buoys, through Straat Dendang, separating the islands of Buton and Dendang ; thence between the island of Tjitjin, about 2 miles south-south-eastward of the southern extremity of Buton, and the islands of Dendang and Angkut ; thence northward and eastward of Pelakam, lying about one mile eastward of Kojan, into Straat Kelong, which separates the large island of Kelong from Kojan ; thence south-westward, passing northward of Bulat ; and thence westward through the channel northward of Mantang and Siulung, described on page 196.

The entire route was swept, in 1948, to a least depth of 4 fathoms ($7^{m}3$) over a width of 230 feet ($70^{m}1$).

Minor passages eastward of Straat Kidjang.—Straat Angkut, between Kojan and Angkut, and Straat Tempeh, between Angkut and Dendang, are available only for small craft with local knowledge ; the islet of Bulan lies in the eastern entrance to the latter strait.

The channels northward and eastward of Kelong leading into Straat Poto (page 194) are tortuous and encumbered with shoals. The islets of Temborah Laut and Temborah Darat lie within three-quarters of a mile eastward and north-north-eastward, respectively, of the south-eastern extremity of Kelong. Malim besar, Malim kechil and Pulau Twee are situated close eastward and north-eastward of the northern extremity of Kelong, where very strong tidal streams have been observed ; the islet of Memporo lies in the northern entrance to Straat Poto.

Chart 2413.

STRAAT RIOUW.—Straat Riouw, between the Bintan and Batam groups of Riouw archipel, being well lighted and buoyed, affords a safe and easy channel for vessels of all sizes, and it is, therefore, frequently used. There are many landmarks for fixing a vessel's position by day, and at night the various lights and light-buoys give sufficient guidance. The depths in the fairway of the main channel vary from 7 to 30 fathoms ($12^{m}8$ to $54^{m}9$).

Straat Riouw was swept by vessels of the Netherlands Government in 1932. Two channels were swept in the southern part of the strait, and these are fully described in the Directions for Straat Riouw on page 211. A least depth of 9 fathoms ($16^{m}5$) can be carried through

Chart 2413.

the main channel by passing about one mile eastward of Karas kechil, situated about 8½ miles westward of Tanjong Punggung (page 195); in the eastern channel there is a least depth of 3¾ fathoms ($6^{m}9$).

Currents and tidal streams.—In Straat Riouw the tidal streams, as a rule, flow strongly only once a day in each direction (north and south). They are predicted in Admiralty Tide and Tidal Stream Tables for a position off Tanjong Taloh (*Lat. 1° 00′ N., Long. 104° 12′ E.*) in the northern part of the strait and for a position south of the southern entrance—Lingga Archipelago, N.E. Approaches (*Lat. 0° 37′ N., Long. 104° 25′ E.*) where they set 060° and 240°. The predictions give the time of maximum rate in either direction, the times at which the streams turn and the maximum rate in either direction.

In addition there is a current, not included in the predictions, which, off Tanjong Taloh, sets up to ¼ knot 000° from April to November inclusive and ¼ to ¾ knot 180° from December to March inclusive. In the southern approaches the additional current sets 240° at ¼ to ¾ knot from December to March and is negligible for the rest of the year.

Off Tanjong Taloh the maximum rate of the north-going stream can be expected to average (including the current) about 3¾ knots from April to June and from October to December, at approximately semi-diurnal spring tides. The maximum rate of the south-going stream can be expected to average 4 knots in December and January and in June and July, at approximately semi-diurnal spring tides.

In the southern half of the strait, between Lobam and Karas, the description of the tidal streams just given also applies, but the times given in the predictions must be increased by 45 minutes, and the rate is only a little more than half that given; the tidal streams here run north-westward and south-westward.

The west-going stream in the eastern part of Singapore strait partly curves round the north-western coast of Bintan and flows southward into Straat Riouw. At Lobam the stream divides, one part flowing east-south-eastward to Tandjung Pinang, and the other south-south-eastward through the main channel. At Karas kechil (*Lat. 0° 44′ N., Long. 104° 22′ E.*) the direction of the stream becomes south, and, after uniting with the stream which runs southward along the eastern coast of Bintan and thence through Straat Telang in a west-south-west direction, it continues through Straat Dempo, Straat Abang and Straat Pengelap.

The east-going stream in Singapore strait is coupled with the north-going stream through Straat Riouw; at the same time the stream sets into Straat Riouw from Straat Dempo, Straat Abang and Straat Pengelap, as well as from Straat Telang. As the maximum rate of the stream between Straat Dempo and Straat Telang may be 2¼ knots, vessels which are obliged to wait off the southern entrance to Straat Riouw owing to bad visibility, etc., can be set considerably east-north-eastward or south-south-westward.

On 5th April, 1934, H.M.S. *Veronica* experienced a tidal stream setting south-south-eastward, with a rate of three-quarters of a knot, between Karas kechil and Lobam, approximately 2 hours after high water at Singapore, and a south-going stream between Lobam and Tandjung Sau about 3¾ hours after high water at Singapore; in a position about 2 miles south-south-eastward of Pan rif a tidal stream

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

setting north-westward, with a rate of three-quarters of a knot, was experienced approximately 4¼ hours after high water at Singapore.

On 14th October, 1936, H.M.S. *Folkestone* experienced a south-going stream, with a rate of 1½ knots, when passing through Straat Riouw 2 hours after higher high water at Singapore.

On 29th September, 1936, when proceeding southward through Straat Riouw, and again on 2nd October when proceeding northward, H.M.S. *Grimsby* experienced a south-going stream, with an average rate of 1½ and 1¾ knots, respectively, between Lobam and Pan rif; these were 2 hours before and one hour after high water at Singapore, respectively. On each occasion the stream was considerably stronger between Lobam and Tandjung Sau; between Lobam and Penjengat it was very weak, running parallel to the coast with a rate of less than half a knot.

Southern entrance to Straat Riouw.—Light.—Buoyage.—Beacon.—The southern entrance to Straat Riouw lies between Tanjong Punggung (page 195) and Tanjong Tjakang, the southern extremity of Galang Baru, situated nearly 16 miles west-south-westward.

Dempo is a thickly wooded islet, 144 feet ($43^{m}9$) high, situated nearly 1½ miles south-eastward of Tanjong Tjakang, and, owing to its regular rounded shape, is an excellent landmark. Haai rif, with a depth of 1½ fathoms ($2^{m}7$), lies about a quarter of a mile southward of Dempo, and the tidal streams are strong near this reef; the eastern extremity of Karas kechil bearing 020°, and just open eastward of the eastern extremity of Korek Rapat, leads about 4 cables eastward of this reef, and the light on the former islet is obscured in its vicinity when westward of the bearing 018°. A group of rocks, always above water, lies about 3 cables north-north-westward of Dempo.

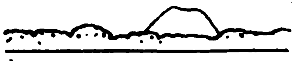
Several islands lie off the eastern side of Galang Baru, the principal being Sembur, Batu Belobang, Tandjung Dahan, Korek Busung, and Korek Rapat; the narrow straits between these islands are difficult to navigate without local knowledge. There is a cave in the soft red sandstone which forms the south-western extremity of Batu Belobang, a cleft on the seaward side giving access at low water. A shoal, with a least depth of 2 fathoms ($3^{m}7$) over it, lies about midway between Dempo (*Lat. 0° 36′ N., Long. 104° 18′ E.*) and Batu Belobang. Korek Rapat should be given a good berth, as a shoal extends about a quarter of a mile south-eastward and half a mile north-eastward from its eastern extremity, and East bank, with a least depth of three-quarters of a fathom ($1^{m}4$) over it, lies between 3 and 6 cables southward of the same point. *See* views of Tafelberg facing this page.

Galang is separated from Galang Baru by Straat Penjabung, which is very shoal in the eastern entrance and can only be navigated by small vessels with local knowledge; the western entrance is obstructed by reefs, *see* page 228. Tanjong Maralagan, the south-eastern extremity of Galang, is a high, wooded point.

Karas besar lies with its western extremity about 2¾ miles north-north-westward of Tanjong Maralagan, and has a conspicuous tree with a bare trunk on its eastern part. The island is surrounded by a reef, and Tjassens bank, with a least depth of 3 feet ($0^{m}9$), extends as much as 2 miles from its southern side; a reef, which dries, lies on the south-eastern extremity of this bank. There is a deep channel between

Charts 2757, 1355, 2660a, 941a, 1263.

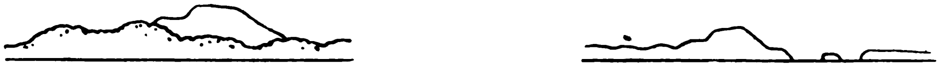
To face page 200.



Gunung Bintan besar,
350°, 24 miles.

View of Gunung Bintan besar from southward.

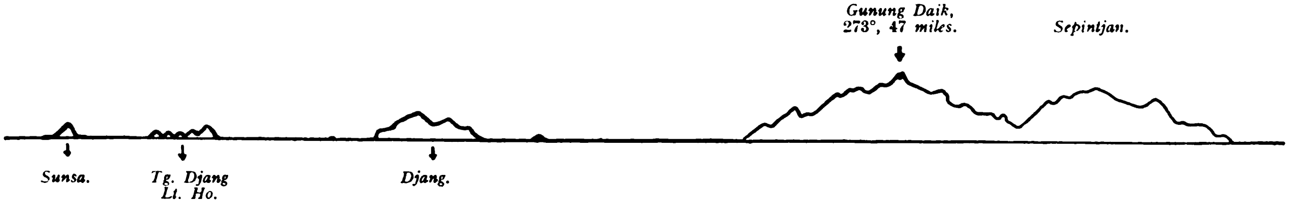
(Original dated 1929.)



Tafelberg, Galang Baru, bearing 276°, 16 miles. Tafelberg, Galang Baru, bearing 294°, 21 miles.

Tafelberg, Galang Baru, 2 views.

(Originals dated 1929.)



View of Lingga from eastward of Tanjong Djang.

(Original dated 1929.)

Chart 2413.

Tjassens bank, which is steep-to, and Galang. A reef, which dries, lies nearly one mile east-south-eastward of Tanjong Maralagan, and there is a 4¾-fathom (8^{m}7) patch about 2 miles east-south-eastward of the same point and about 4 cables off the coast of Tandjung Dahan. A rock, with a depth of one foot (0^{m}3) over it, lies about three-quarters of a mile northward of the western extremity of Karas besar; Penika (Steen island) is about 1¼ miles north-westward of the same point. A bank, with depths of less than 5 fathoms (9^{m}1), extends about 1¾ miles northward from the northern side of Karas besar.

Karas kechil, 154 feet (46^{m}9) high, is separated from the eastern extremity of Karas besar by a narrow channel with depths of from 3 to 6 fathoms (5^{m}5 to 11^{m}0); a sandy beach on the south-western side of the islet affords a good landing place.

A light is exhibited, at an elevation of 138 feet (42^{m}1), from a white iron framework structure, 36 feet (11^{m}0) in height, situated on a hill on the eastern side of Karas kechil (*Lat. 0° 44′ N., Long. 104° 22′ E.*).

A shoal, with a least depth of 4¼ fathoms (7^{m}8) over it, lies about 3¾ miles south-eastward of Karas kechil; a light-buoy, exhibiting a *white flashing* light showing *one* flash of *three seconds* duration *every twelve seconds*, marks the south-western side of this shoal. Between this shoal and the Tapai eilanden there are several shoal patches with depths of from 3¾ to 5 fathoms (6^{m}9 to 9^{m}1) over them; these shoals are marked by tide-rips.

A small patch of coral, with a depth of 4¾ fathoms (8^{m}7) over it, lies about 2¾ miles south-south-eastward of Karas kechil. Karang Segutji, with its southern extremity nearly one mile southward of Karas kechil, is a reef of sand and stones which dries.

A 5½-fathom (10^{m}1) coral patch lies about 8 cables north-north-eastward of Karas kechil. Two 5½-fathom (10^{m}1) patches lie about 2 miles eastward and 1¾ miles east-north-eastward, respectively, of Karas kechil, and there is a deep channel between them and this islet. Between these two patches and Rotterdam rif, *see* below, there are depths of from 4¼ to 6 fathoms (7^{m}8 to 11^{m}0).

The Tapai eilanden are a group of five islets covered with vegetation, and, except the western, which lies about 4½ miles east-north-eastward of Karas kechil and is 78 feet (23^{m}8) high, they are all rocky. They are divided into two groups, the two western lying together on one reef, and the three eastern on another; the northern island of the eastern group is 128 feet (39^{m}0) high. The depths around them are very irregular. A reef, which dries, lies about 4 cables northward of the westernmost islet, and there is a 4¼-fathom (7^{m}8) patch about 2 miles north-north-westward of the same islet.

Rotterdam rif, with a depth of 1½ fathoms (2^{m}7) over it, lies about 6 cables westward of the western of the Tapai eilanden, and is marked by a white iron beacon surmounted by a ball. A bank, on which the depths over the greater parts vary between 3 and 5 fathoms (5^{m}5 and 9^{m}1), extends about 5½ miles from the southern extremity of Pangkil (*see* page 202) and forms the eastern side of the main channel; two 3-fathom (5^{m}5) patches, which are the shoalest spots on this bank, lie about 1½ and 3 miles north-westward of Rotterdam rif. Tanjong Punggung (*Lat. 0° 45′ N., Long. 104° 31′ E.*), with the light on it, and Ranggas, with the adjacent dangers, have been described on pages 195-196.

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

Main channel through Straat Riouw.—Lights.—Buoyage.—Beacons.—Pangkil is a hilly island situated with its southern extremity about 4½ miles northward of Karas kechil, and the main channel passes between them ; the summit of the island, 154 feet (46^m9) high, is situated in the southern part, and there is a prominent tree on it. The island is entirely surrounded by a reef, which extends nearly half a mile from its south-eastern side. Rupels rif lies about one mile eastward of Pangkil and dries ; depths of less than 3 fathoms (5^m5) extend about three-quarters of a mile south-south-eastward from this reef. A shoal, with a depth of 4½ fathoms (8^m2) over it, lies about one mile south-westward of the north-western point of the island, and a reef, which dries, lies about half a mile northward of the northern extremity.

Mubut Laut, an islet 180 feet (54^m9) high, is about 3¼ miles westward of the southern extremity of Pangkil and on the western side of the channel ; Mubut Darat is a low islet about half a mile westward of Mubut Laut. These two islets lie off the eastern entrance to Straat Tiung, which separates Rempang and Galang. A spit, with depths of less than 3 fathoms (5^m5) and a reef, which dries, on it, extends about 2 miles southward from Mubut Laut, and a bank, with depths of from 3 feet to 5 fathoms (0^m9 to 9^m1), extends about 1¾ miles northward from both islets. Eastward of this bank a 4½-fathom (8^m2) patch lies about one mile northward of the eastern extremity of Mubut Laut.

Straat Tiung is navigable for small vessels with local knowledge, not exceeding 10 feet (3^m0) in draught ; the south-eastern side of the channel in the eastern entrance is marked by a black can buoy, moored about half a mile west-south-westward of Mubut Darat. About one mile within the western entrance, at the mouth of Sungei Senjantun, there is a landing pier, and farther up this river is a large rubber plantation. For western entrance to this strait, *see* page 229.

Tanjong Sembulang, the eastern extremity of Rempang, is a steep, prominent point, and is fringed by a coastal reef which extends about one cable ; there is a prominent hill, 243 feet (74^m1) high, about half a mile westward of the point. Sungei Sembulang discharges about 1½ miles westward of the point, but the mouth dries entirely. Pakaul is a small islet, covered with dark trees, lying on the coastal reef which extends from the western entrance point.

A 4¾-fathom (8^m7) patch is situated nearly 1¾ miles east-south-eastward of Tanjong Sembulang. A 3¾-fathom (6^m9) patch lies nearly 2¼ miles eastward of this point, and is marked on its eastern side by a light-buoy, painted white, exhibiting a *green flashing* light, showing a *short* flash *every five seconds.* A shoal, with depths of from 4½ to 6 fathoms (8^m2 to 11^m0) extends nearly 2 miles north-westward from a position about 1¾ miles eastward of Tanjong Sembulang. A 4½-fathom (8^m2) patch lies about 3¼ miles north-north-eastward of Tanjong Sembulang (*Lat. 0° 51′ N., Long. 104° 16′ E.*).

There are several islands off the north-eastern coast of Rempang. Tjemara, the southernmost of these, lies about 4½ miles north-westward of Tanjong Sembulang and is hilly ; its summit, 253 feet (77^m1) high, is situated in the northern part. Kinun, Subang Mas and Ajer Radja lie close together, and the two latter are hilly and covered with high trees, but are lower than Tjemara.

Tjemara bank, with a least depth of 1½ fathoms (2^m7) over it, is situated about one mile eastward of Tjemara, and is marked by a white

Chart 2413.

iron beacon surmounted by a ball; the eastern side of Mubut Darat in line with Tanjong Sembulang, bearing 156°, leads fully half a mile eastward of this bank.

Tundjuk, nearly half a mile off the eastern extremity of Subang Mas, is a flat island surrounded by a reef, and there is foul ground, with portions which dry, between it and Tjemara. A 4½-fathom (8^m2) patch and a 5½-fathom (10^m1) patch lie about 3 cables and 9 cables, respectively, northward of Tundjuk. Leading lights are shown on Tundjuk (*Lat. 0° 57′ N., Long. 104° 12′ E.*); the front light is exhibited, at an elevation of 49 feet (14^m9), from a structure surmounted by a white triangle point upwards, and the rear light, at an elevation of 72 feet (21^m9), from a structure surmounted by a white triangle point downwards, about 2½ cables southward of the front light. These two lights are in line bearing 180°, and lead through the northern part, of Straat Riouw.

Pentjaras is an islet close off the eastern extremity of Ajer Radja; it is surrounded by a reef which dries, and a rock of a reddish colour, with a prominent tree on it, lies on the north-eastern part of this reef. There are depths of 2 fathoms (3^m7) and less westward of the line joining this rock and the eastern extremity of Subang Mas.

Isabella bank, on the north-eastern side of the main channel, is a narrow ridge, with depths of less than 5 fathoms (9^m1), extending about 1½ miles east-south-eastward from a position about 2½ miles east-north-eastward of Tundjuk; the shoalest part, with a depth of 5 feet (1^m5), lies in about the centre, and is marked by a black iron beacon surmounted by a cone. The light-structures on Tandjung Sau and Lobam kechil, in line bearing about 327°, lead about a quarter of a mile south-westward of Isabella bank.

Lobam lies with its south-western extremity about 2½ miles north-eastward of Tundjuk and is hilly in the western part; there is a prominent group of trees on the highest and westernmost hill, and the top of the highest of these trees, with a broad, flat crown, is 318 feet (96^m9) high. The island is surrounded by a reef, except on the northern side, and there is a detached reef, which dries, close off its south-western extremity. There is a deep channel between the northern side of Lobam and the Bintan coast, only available for vessels with local knowledge; the south-eastern entrance lies between the reef which extends from the eastern side of Lobam and the western end of Irene bank (page 209). The western entrance is obstructed by several shoals and reefs, but there is a narrow passage close along Tanjong Taloh, *see* page 204.

Lobam kechil lies close off the western side of Lobam and is lower than that island; it is surrounded by a reef, with a rock above water on it north-westward of the islet; three rocks, which dry, lie outside this reef, the south-western lying about 3 cables north-westward of Lobam kechil.

A light is exhibited, at an elevation of 39 feet (11^m9), from a black iron framework structure, 30 feet (9^m1) in height, situated on the south-western point of Lobam kechil. In 1946, it was reported that the structure was partially obscured by trees.

Orïon rif, nearly half a mile westward of the southern extremity of Lobam kechil, has a depth of 2½ fathoms (4^m6) over it and is steep-to; a black can buoy, surmounted by a truncated cone, is moored off

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

its western side. Tanjong Uban (*see* below), bearing 000°, leads about 4 cables westward of this reef.

Tanjong Taloh is a prominent point about 2 miles northward of Lobam kechil; Karang Plasit, about half a mile south-westward of the point, is a sandbank above water. There are other banks and shoals between Karang Plasit and Lobam, the positions of which are best seen on the chart.

Buau lies with its southern extremity about one mile northward of Tanjong Taloh (*Lat. 1° 01′ N., Long. 104° 14′ E.*), and is a thickly wooded island, flat on its northern side and rising to a height of 160 feet ($48^{m}8$) in the centre; it is surrounded by a reef and there is a fairly prominent rock close to the western coast.

A reef, which dries, lies about 2 cables southward of Buau, and there is a rock, which dries, about a quarter of a mile south-eastward of the southern extremity of the island. A shoal, with a least depth of 1½ fathoms ($2^{m}7$), lies between Buau and Tanjong Uban, a low point, covered with high trees, situated about one mile northward. Except for these dangers there is a channel available for small craft with local knowledge, with depths of from 2¾ to 10 fathoms ($5^{m}0$ to $18^{m}3$), between Buau and the Bintan coast. A small strip of sandy beach is usually visible at Tanjong Uban; the oil station, piers, etc., near this point are described on page 205.

Nginang and Tandjung Sau are two hilly islands on the western side of the main channel, lying with their eastern extremities about 2½ miles westward of Tanjong Taloh and 2 miles south-westward of Tanjong Uban, respectively, and are separated from each other by Straat Pedissa, a narrow channel with depths of from 2¾ to 6 fathoms ($5^{m}0$ to $11^{m}0$); Nginang lies on the northern side of the eastern entrance to Straat Bulan (page 273). The eastern sides of both islands are fringed by a reef which extends as much as a quarter of a mile; a projection of the coastal reef extends about 1½ miles southward from the light-structure on the eastern extremity of Tandjung Sau, and the southern extremity of this projection forms the northern side of the eastern entrance to Straat Pedissa. A reef, which dries, lies about three-quarters of a mile eastward of the southern extremity of Nginang, and is generally marked by fishing stakes; there is a shoal, with a least depth of 4 fathoms ($7^{m}3$), about 2 cables south-south-westward of this reef. A shoal, with a least depth of 3¾ fathoms ($6^{m}9$), sand and coral, over it, lies about one mile eastward of the northern extremity of Nginang.

In the northern part of Tandjung Sau is a hill, 183 feet ($55^{m}8$) high, with a prominent bare tree on it. A reef which dries, lies about a quarter of a mile south-eastward of the eastern point of the island. Sau, an islet lying on the coastal reef which extends from the north-eastern side of Tandjung Sau, has a prominent red patch on its eastern side. Van Gogh's eiland, about 6 cables northward of Tandjung Sau, consists of several rocks partly covered with low brushwood, surrounded by a reef which dries, having another above-water rock on the southern part. A shoal, with depths of less than 5 fathoms ($9^{m}1$), extends about 1½ miles northward from the northern extremity of Tandjung Sau, and a narrow reef, with a least depth of 2 feet ($0^{m}6$), extends about 1¾ miles northward from a position half a mile west-north-westward of Van Gogh's eiland. The light-structure on Tandjung Sau in line with

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

the eastern extremity of Sau, bearing 174°, leads eastward of these dangers.

A light is exhibited, at an elevation of 108 feet (32^{m}9), from a white iron framework structure, 36 feet (11^{m}0) in height, situated on the eastern point of Tandjung Sau (*Lat. 1° 03′ N., Long. 104° 11′ E.*).

Anchorage.—Directions.—There is convenient anchorage, in a depth of 10 fathoms (18^{m}3), mud and sand, westward of Tandjung Sau and northward of Lukus, an islet lying about 3 cables south-westward of the western point of Tandjung Sau. This anchorage can be reached either from northward or southward. In the latter case a vessel should steer to pass between Nginang and Pentjaras in a least depth of 5½ fathoms (10^{m}1), keeping the south-western point of Momoi, an islet about 1¼ miles north-westward of the north-western extremity of Ajer Radja, in line, bearing 274°, with the southern point of Kila, lying about 6 cables northward of the north-western extremity of Ajer Radja, which leads southward of the dangers lying south-eastward of the southern extremity of Nginang. Thence proceed through the channel between Nginang and Kila, by keeping the southern light-structure on Tundjuk bearing about 136° astern and seen midway between Pentjaras and Ajer Radja. A northerly course should then be steered to pass midway between Nginang and Mandjing, about half a mile north-north-eastward of Kila, and thence between Radja and Kubong, situated about 4 cables north-eastward of Mandjing.

Vessels making for the anchorage from northward should pass between the reef lying north-westward of Van Gogh's eiland and the Batam coast, bearing in mind that the coastal reef here is nearly half a mile broad. A reef, which dries, lies about 1¾ miles north-north-westward of Lukus (*Lat. 1° 02′ N., Long. 104° 09′ E.*) and about 4 cables off the Batam coast, and there is a 4-fathom (7^{m}3) patch about three-quarters of a mile south-eastward of Tanjong Butan, situated about 2¾ miles north-north-westward of Van Gogh's eiland.

Tandjung Uban.—Oil station.—Lights.—Beacon.—Some oil tanks with a boiler-house and other appurtenances, are situated close northward of Tanjong Uban; there is no communication with the interior other than a road to Tandjung Pinang, *see* page 209, and the place is merely a loading station for oil tankers. Five piers, numbered 1 to 5 from north to south, each with a **T**-head, extend from the coast here to the edge of the coastal reef, which is steep-to. In 1952 there were the following depths alongside the piers :—No. 1, 43 feet (13^{m}1); No. 2, 38 feet (11^{m}6); No. 3, 15 feet (4^{m}6); Nos. 4 and 5, each 34 feet (10^{m}4).

A light, maintained privately, is exhibited from the head of each pier. A black iron beacon, surmounted by a truncated cone, stands on the edge of the coastal reef, about 2 cables northward of the northernmost pier.

When approaching from northward or southward the three tall chimneys of the boiler-house are the first objects sighted; bright white lights are sometimes seen here at nights. Radio masts are situated about 4 cables southward of the chimneys at Tandjung Uban. A motor boat proceeds from Tandjung Uban to Singapore, and back, every other day, and the only other means of communication is by radio.

Pilotage.—Vessels exceeding 500 cubic metres capacity, taking in

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Charts 2413.

oil alongside the piers at Tandjung Uban, must employ the services of a pilot provided by the oil company. The probable time of arrival can be communicated by radio. Pilotage is not available at night.

Anchorages.—Cable.—Owing to the existence of a telegraph cable and the fact that the leading line of the Tundjuk lights passes fairly close to the Bintan coast here, and also because of the very bad holding ground in the vicinity, anchorage is inadvisable westward of the piers. The usual anchorage for large vessels is in a depth of about 14 fathoms (25^{m}6), sand and good holding ground, with Tandjung Sau light-structure (*Lat. 1° 03′ N., Long. 104° 11′ E.*) bearing 248° and the head of the northernmost pier bearing 008°. Small vessels can anchor closer inshore abreast the red-roofed shed, which is built out into the sea, where there is also good holding ground.

Berthing.—Tidal streams.—Along the heads of the piers there is frequently an undercurrent extending about half a cable from the edge of the reef which sets in the opposite direction to the main stream for an hour or two before the turn of the stream as predicted. This under-current frequently affects deep-draught vessels more than the surface stream so that care in berthing is necessary. When the main stream is running near its maximum rate, the stream for half a cable off the piers is considerably less than, and may vary in direction from, the main stream. During the East monsoon with a strong north-westerly wind, and a moderately strong north-going stream, vessels in ballast should moor against the wind; if, however, the stream is stronger than the wind, or there is any doubt concerning their relative strengths, it is advisable to moor against the stream. Resilient dolphins keep vessels about 10 feet (3^{m}0) clear of the piers. Two mooring boats are available.

Supplies.—Fuel and diesel oil are plentiful. Drinking and boiler water can be obtained in any quantity.

Quarantine.—Quarantine formalities should be carried out at Rede Pulu Sambo (*see* Malacca Strait Pilot) before arrival.

Firing practice.—A black ball and a red flag displayed at the Harbourmaster's flagstaff indicates that firing practice is taking place in Singapore strait.

Chart 3834.

Northern entrance to Straat Riouw.—Light.—Beacons.—Buoy.—The northern entrance to Straat Riouw lies between Tanjong Bulu (Boel), a high prominent point forming the north-eastern point of Batam, and Tanjong Tondang, about 12¼ miles eastward.

The eastern coast of Batam, which forms the western side of the northern entrance of the strait, is hilly, covered with vegetation, and there are a few scattered villages; it is fringed by a reef, which extends as much as three-quarters of a mile in the northern part, and there are several rocks on it, the largest being Batu besar, of a reddish colour, situated about one mile northward of Tanjong Sabang, a point about 4¼ miles south-eastward of Tanjong Bulu (*Lat. 1° 12′ N., Long. 104° 06′ E.*). There are numerous fishing stakes on the edge of the coastal reef.

Karang Passo, known locally as Malang Orang, lies about half a mile south-eastward of Tanjong Sabang and dries; it is separated from the coastal reef by a narrow channel with depths of from 4 to 6 fathoms (7^{m}3 to 11^{m}0). It is marked by a white iron beacon surmounted by

Charts 2413, 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 3834.

a ball. A small patch of stones, with a depth of 24 feet ($7^{m}3$) over it, lies about 1½ miles east-south-eastward of Tanjong Sabang.

Pan rif, known locally as Karang Galang, about 2 miles east-north-eastward of Tanjong Sabang, consists of stones with a little coral, and dries. It is steep-to except on the southern side, where a shoal, with depths of less than 5 fathoms ($9^{m}1$), extends about three-quarters of a mile south-south-westward. The eastern extremity of Tandjung Sau in line with the eastern extremity of Sau, bearing about 174°, leads between Pan rif and Karang Passo, but passes fairly close eastward of the 24-foot ($7^{m}3$) patch lying about 6 cables south-eastward of the latter reef; vessels with a draught of less than 26 feet ($7^{m}9$) can use this passage by day. Three patches, with depths of from 23 to 33 feet ($7^{m}0$ to $10^{m}1$) over them, lie from 2 to 3 cables eastward of Pan rif, and there is a 33-foot ($10^{m}1$) patch nearly one mile south-south-eastward of the reef.

A light is exhibited, at an elevation of 30 feet ($9^{m}1$), from a white iron beacon, 33 feet ($10^{m}1$) in height, situated on the north-eastern extremity of Pan rif (*Lat. 1° 10′ N., Long. 104° 11′ E.*). A black iron beacon, surmounted by a cone, stands on the south-western edge of the reef.

Pas op klip, with a least depth of 6 feet ($1^{m}8$) over it, lies about 2¼ miles northward of Tanjong Sabang and one mile offshore; it is marked by a white iron beacon surmounted by a ball. A black conical buoy, No. 21, is moored about 3¼ miles east-north-eastward of Pas op klip.

Chart 2413.

The eastern side of the northern entrance, between Tanjong Uban and Tanjong Sebong, about 3¾ miles north-north-eastward, is fringed by a reef which extends as much as half a mile, and on which are numerous rocks. Malang Senggera, about one mile northward of Tanjong Uban, is a group of rocks lying on the coastal reef, and only covers at the highest tides. Malang Ladi, about half a mile northward of Malang Senggera, is a group of rocks always above water. Malang Djarum, about 6 cables northward of Malang Ladi, is a small islet covered with low trees. The coast between this islet and Tanjong Sebong must be given a wide berth, as there are depths of less than 3 fathoms ($5^{m}5$) for fully one mile offshore. Sekerah is a thickly wooded islet lying on the coastal reef which extends from Tanjong Sebong.

Chart 3834.

Sebong baai, entered between Tanjong Sebong and Tanjong Tondang, about 5½ miles north-eastward, is mostly occupied by a coastal reef which dries, and there are numerous reefs and rocks outside it. The shores are wooded and fringed by a narrow sandy beach; Sungei Sebong and Sungei Sebong kechil discharge into the eastern part of the bay. A 33-foot ($10^{m}1$) patch lies about 2¾ miles north-north-westward of Tanjong Sebong, and for 2 miles southward of this patch there are irregular depths varying between 6½ and 19 fathoms ($11^{m}9$ and $34^{m}7$). Several shoals, with depths of less than 18 feet ($5^{m}5$) over them, lie within a distance of 2 miles northward of Tanjong Sebong. Batu Senukuh, a rock 10 feet ($3^{m}0$) high, is situated about 2½ miles north-eastward of Tanjong Sebong, and there are several above-water rocks southward and south-eastward of it. Three sunken rocks lie

Charts 2413, 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 3834.

nearly one mile northward of Batu Senukuh. The depths for about 2 miles westward of Tanjong Tondang are irregular. Crocodile shoal, about 1½ miles north-north-eastward of Batu Senukuh, and a patch about 6 cables east-north-eastward of it have each a least depth of 18 feet (5^m5) over them.

Tanjong Tondang is rugged, overgrown, and can be readily identified by Tondang, a small islet lying about a cable westward of the point; close southward of this islet is a rock with two coconut trees on it.

Chart 2413.

Eastern part of Straat Riouw.—Light.—Buoys.—Mantang, on the eastern side of the southern entrance to Straat Riouw, with the islets and dangers off its western side, have been described on pages 195-196; the Tapai eilanden and Rotterdam rif have been described on page 201.

Dompak is a hilly island lying with Tanjong Setumu, its western extremity, about 6 miles northward of the western of the Tapai eilanden, and is separated from the western side of Bintan by Straat Dompak, a narrow channel only available for small craft. A hill, 249 feet (75^m9) high, is situated in the middle of the northern coast, and has a prominent tree on it with a square crown. There is also a prominent tree, with a plume-shaped top, on the low Tanjong Setumu, and about one mile eastward of that point there is a hill, 294 feet (89^m6) high. Kampong Dompak is situated on Tanjong Rambut, the eastern point of the island, and Batu Butik, another village, lies about one mile east-south-eastward of Tanjong Setumu. Sekatap is a low islet lying on the coastal reef which extends fully half a mile west-south-westward from Tanjong Rendang, the southern extremity of Dompak, and Basing, a similar islet, lies about 3 cables south-westward of Tanjong Siambang, which is situated about one mile south-eastward of Tanjong Setumu. A white conical buoy, surmounted by a ball, is moored about 6 cables southward of Tanjong Setumu, and marks the edge of the coastal bank which extends from the western side of Dompak.

Soreh (*Lat. 0° 52′ N., Long. 104° 23′ E.*), nearly 2 miles west-south-westward of Tanjong Setumu, is a low islet covered with coconut trees and surrounded by a reef, which extends about a quarter of a mile from its southern side, and is prolonged for a further 1½ miles south-south-eastward by a bank with depths of less than 5 fathoms (9^m1). A shoal, with a least depth of 3 fathoms (5^m5) over it, lies about three-quarters of a mile east-south-eastward of Soreh; a black can buoy, surmounted by a truncated cone, marks the south-eastern side of this shoal.

Soreh riffen are three reefs of sand and stones, which only cover entirely at high water, lying on a bank, with depths of less than 5 fathoms (9^m1), which extends about 3½ miles in a north-westerly direction from a position about half a mile northward of Soreh. A conical buoy, painted white, with ball topmark, is moored about 3 cables north-westward of the northern extremity of Soreh riffen. A 4½-fathom (7^m8) patch lies about three-quarters of a mile eastward of the same point.

Penjengat is a hilly, inhabited island lying about 3 miles northward of Tanjong Setumu; there is a prominent tree on a hill, 173 feet (52^m7) high, on the western part of the island. A pier extends from the

Charts 2413, 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

northern coast, and boats can lie alongside it even at low water. Paku, about half a mile southward of the eastern extremity of Penjengat, is a reef of sand and stones with a couple of low bushes on it. It is marked, on its south-eastern side, by a black can buoy.

Terkulai, about 4 miles west-north-westward of Penjengat, is a flat, sandy island, covered with coconut trees; except on the northern side, where there is a narrow sandy beach forming a good landing place, the island is surrounded by a reef, which extends about half a mile from its eastern extremity. Terkulai lies on a large bank, with depths of less than 3 fathoms ($5^{m}5$) over the greater part, which extends from the Bintan coast; the western part of this bank, which terminates about half a mile eastward of Lobam, is named Irene bank and dries in places.

A light is exhibited, at an elevation of 42 feet ($12^{m}8$), from a white iron framework structure, 42 feet ($12^{m}8$) in height, situated on the north-western side of Terkulai. A black can buoy, surmounted by a truncated cone, marks the south-western side of a $1\frac{3}{4}$-fathom ($3^{m}2$) patch lying about one mile south-south-eastward of the eastern extremity of the island.

Tandjung Pinang.—Tandjung Pinang, known by the Dutch as Riouw, is situated on the north-western side of the peninsula of Tandjung Pinang and immediately eastward of Penjengat. Fort Kroonprins stands on a hill, 229 feet ($69^{m}8$) high, on the southern side of the town and is prominent. Senggarang is a large Chinese village on the southern side of the island of Senggarang and about three-quarters of a mile northward of Tandjung Pinang (*Lat. 0° 56′ N., Long. 104° 27′ E.*).

A pier, with a depth of 7 feet ($2^{m}1$) at its **T**-shaped head, which has a width of about 200 feet ($61^{m}0$), extends about $1\frac{1}{2}$ cables in a north-westerly direction from the town; there are numerous steps at the pier, and there are concrete dolphins off the head for securing hawsers. A flagstaff stands on the south-western extremity of the pier head; an orange-coloured ball is displayed from this flagstaff half an hour before the expected time of arrival of a seaplane in the roadstead. A stone pier, in a state of decay, is situated about half a mile southward of the main pier, and its outer end dries.

The roadstead is bounded by: (1) the line drawn from the light-structure on Tanjong Batu Hitam to the western point of Dompak; (2) the line drawn 292° from this point; (3) the line drawn 202° from the western extremity of Los, an island situated about one mile northward of Penjengat, between its points of intersection with lines (2) and (4); (4) the line drawn 292° from the western point of Penjengat; (5) the line drawn 022° from the eastern point of Penjengat; (6) the meridian through a position about one mile eastward of the pier at Tandjung Pinang.

The outer road, for vessels exceeding 12 feet ($3^{m}7$) in draught, is southward and south-westward of Penjengat; the bottom consists of thick mud. With strong, continuous, southerly and westerly winds there is often a considerable sea, and loading and discharging cargo is difficult; with northerly winds the roadstead is somewhat sheltered by Penjengat.

The inner road is northward of the pier at Tandjung Pinang, and can be reached at high water by vessels not exceeding 12 feet ($3^{m}7$) in draught. There is good anchorage here in a depth of $2\frac{1}{2}$ fathoms ($4^{m}6$), soft mud; there is no danger of fouling the anchor as it sinks

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

well into the mud. Farther eastward the channel deepens somewhat as far as Bajan, an islet situated about half a mile eastward of Tandjung Pinang, after which it becomes shoaler and narrower. A bank of soft mud, which forms the northern side of the channel, extends from the southern side of Senggarang.

Directions for the channel leading to Tandjung Pinang are given on page 212.

Lights.—Beacons.—A light is exhibited, at an elevation of 59 feet ($18^{m}0$), from a small stone pillar, 10 feet ($3^{m}0$) in height, situated about 3 cables northward of Tanjong Batu Hitam and one mile southward of Fort Kroonprins.

A light is exhibited, at an elevation of 23 feet ($7^{m}0$), from an iron gallows on the head of the pier at Tandjung Pinang (*Lat. 0° 56′ N., Long. 104° 27′ E.*).

Leading lights are shown at Senggarang. The front light is exhibited, at an elevation of 19 feet ($5^{m}8$), from a white iron framework structure, surmounted by a triangle point upwards, situated near a wharf; the rear light is exhibited, at an elevation of 32 feet ($9^{m}8$), from a white iron framework structure, surmounted by a triangle point downwards, situated about 1¾ cables northward of the front light. These lights are in line bearing 004°, and lead through the channel between Paku and the Bintan coast to the inner roadstead. The western side of this channel is marked by three black beacons surmounted by cones, situated, respectively, about 1¾ miles, 1½ miles and 9 cables southward of the front leading light-structure at Senggarang, and the eastern side by one white beacon surmounted by a ball; the latter beacon is situated 1½ cables south-south-westward of the head of the pier and marks the edge of the coastal bank, which dries. All four beacons are fitted with two reflectors, disposed vertically, *see* page 15.

Harbour facilities.—There is a Government coal depôt, having a wooden pier with a depth of about 7 feet ($2^{m}1$) alongside, at Bajan. A slipway, which can accommodate a vessel up to 180 tons, is situated on the eastern extremity of this islet.

Water, which should be boiled before drinking, can be taken in at the town pier. Nearly all provisions are transhipped from Singapore by motor vessels.

There is frequent communication with Singapore by sea. The K.L.M. maintains a weekly service to Tandjung Pinang. A road connects Tandjung Pinang and Tandjung Uban. Tandjung Pinang is connected to the general telegraphic system by radio, through Malabar.

There is a hospital, where medical assistance can be obtained.

Firing practice.—A black ball and a red flag, displayed at the Harbourmaster's flagstaff, indicates that firing practice is taking place in Singapore strait.

Bintan baai and adjacent coast.—Bintan baai is entered between Tanjong Geliga (*Lat. 0° 58′ N., Long. 104° 25′ E.*), the western extremity of Senggarang, and Tanjong Rungus, the western extremity of Udjan, about 3 miles west-north-westward.

Udjan is a wooded island, 60 feet ($18^{m}3$) high, separated from the Bintan coast by a narrow shoal channel; Kampong Pengudjan is situated on the eastern point. A bank of mud, sand, stones and coral, which dries, extends as much as half a mile from the southern and

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

eastern sides of the island. A channel, with depths of over 3 fathoms ($5^{m}5$), runs fairly close along the western sides of Penjengat and Los, terminating about 1¾ miles north-eastward of the eastern point of Udjan, but elsewhere there are depths of from 2 feet ($0^{m}6$) to 2¼ fathoms ($4^{m}1$), and a bank, which dries, extends fully one mile from the northern shore of the bay. The approach to this channel is much obstructed by fishing stakes. Los is a rocky, wooded islet, with a hillock on it 131 feet ($39^{m}9$) high, lying close off Tanjong Geliga.

A few rivers discharge into the bay. Sungei Gresik flows out along the northern side of Senggarang. Sungei Tjaruk Baru flows into the eastern part of the bay, and has depths of from 2¾ to 3¾ fathoms ($5^{m}0$ to $6^{m}9$), with a breadth varying from a quarter to half a cable, over a length of about 3 miles. Sungei Bintan discharges on the northern side of the bay, but its mouth dries, although there are depths of about 2¾ fathoms ($5^{m}0$) over a short distance within.

The coast westward of Bintan baai, between Udjan and Lobam, is uniformly wooded, and is fringed by a bank of mud and sand, which dries, extending as much as one mile in places. Tanjong Radja is situated about 2 miles westward of Tanjong Rungus, and Sungei Radja flows out along its eastern side; within the bar off this river there are depths of from 2 to 2¾ fathoms ($3^{m}7$ to $5^{m}0$).

Charts 2413, 2757.

DIRECTIONS FOR STRAAT RIOUW.—Vessels bound for Straat Riouw from southward may sometimes experience difficulty in identifying the entrance on account of the numerous islands, which are all more or less alike. When Merodong, an island on the southern side of Straat Merodong (page 225) is sighted, however, it will be a guide for identifying the other landmarks.

From a position about 13 miles eastward of Tanjong Djang (page 188) a course of about 329° should be made good for about 39 miles, passing about 5 miles eastward of Selentang (page 189), to a position about 8 miles north-eastward of Pollux rock (page 189); thence a course of 312° should be made good to the middle of the southern entrance to Straat Riouw, thus passing nearly 2 miles north-eastward of the outer edge of the 6-fathom ($11^{m}0$) line off Mesanak; *see* page 225 for dangers eastward of that island. Vessels must bear in mind, however, that in December, January and February there is a south-going stream, with a rate of 3 knots, with strong northerly and north-easterly winds, and a vessel is thus set in. Beruan, Numbing, the Gin eilanden, Telang, Dempo, and Tafelberg on Galang Baru, are useful marks for fixing the vessel's position. In thick weather, the bank which extends north-eastward from Mesanak (*Lat. 0° 25′ N., Long. 104° 32′ E.*), described on page 191, is a useful guide.

Chart 2413.

Main channel through Straat Riouw.—The main channel through Straat Riouw presents no difficulties. A vessel entering from southward should pass three-quarters of a mile westward of the light-buoy marking the 4¼-fathom ($7^{m}8$) shoal about 3¾ miles south-eastward of Karas kechil, taking care to avoid the 4¾-fathom ($8^{m}7$) patch lying about 2¾ miles south-south-eastward of that islet. Thence pass about one mile eastward of Karas kechil, and about 1¼ miles westward of the southern extremity of Pangkil. Pass eastward of the light-buoy

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

marking the 3¾-fathom ($6^{m}9$) patch lying nearly 2¼ miles eastward of Tanjong Sembulang (*Lat. 0° 52′ N., Long. 104° 16′ E.*) and then steer to pass about 1¼ miles north-eastward of Tandjuk ; the light-structures on this islet, in line bearing 180° astern, lead through the northern part of the strait, but pass fairly close eastward of the shoal, with a depth of 3¾ fathoms ($6^{m}9$), lying about one mile eastward of the northern extremity of Nginang. The route indicated by the directions just given is approximately the axis of a channel which was swept in 1932, to a minimum depth of 7 fathoms ($12^{m}8$), by vessels of the Netherlands Government ; this channel is about one mile broad, and in places considerably more, throughout the strait.

Vessels from northward can follow the directions just given in the reverse order. The safest route is eastward of Pan rif ; abreast Tandjung Uban and Buau, the eastern side of the channel should be held if the light-structures on Tundjuk have not been sighted. With the above light-structures in line a southerly course should be held until the light-structure on Lobam kechil bears 095°.

Eastern channel through Straat Riouw and to Tandjung Pinang.—Small vessels, or those bound for Tandjung Pinang, can proceed through a swept channel in the southern part of the eastern side of Straat Riouw ; the least depth in the fairway of this channel is 3¾ fathoms ($6^{m}9$), and, except for a portion of it between Dompak and Soreh, the average breadth is about one mile.

This channel is entered from southward by steering a north-north-westerly course between Ranggas and the Tapai eilanden, taking care to avoid the shoal, with a least depth of 3 fathoms ($5^{m}5$), which lies about 6 cables south-south-eastward of the eastern of the Tapai eilanden, and passing westward of the white conical buoy moored about one mile north-westward of Ranggas. Thence pass in mid-channel between Basing and the black can buoy marking the shoal, with a depth of 3 fathoms ($5^{m}5$), which lies about three-quarters of a mile east-south-eastward of Soreh, and westward of the white conical buoy moored about 6 cables southward of Tanjong Setumu ; when past this point, and the light-structure on Terkulai bears about 314°, a more westerly course can be steered so as to pass between the white conical buoy marking the north-western extremity of the Soreh riffen and the black can buoy marking the 1¾-fathom ($3^{m}2$) patch lying about one mile south-eastward of Terkulai. Pass southward of the black beacon on Isabella bank, and then proceed through the northern part of the strait with the Tundjuk light-structures in line, bearing 180° astern, as directed for the main channel. If a vessel follows the directions just given, she will be approximately on the axis of the swept channel throughout.

Vessels bound for Tandjung Pinang from southward can also enter Straat Riouw by passing between Karas kechil and the light-buoy moored about 3¾ miles south-eastward of that islet, as directed for the main channel, and then shaping course to pass westward of the white beacon on Rotterdam rif and eastward of the shoal with a depth of 3 fathoms ($5^{m}5$), lying about 1½ miles north-westward ; fishing stakes lie close north-westward of this route and about 2 miles north-eastward of Karas kechil. A 3¼-fathom ($5^{m}9$) patch lies nearly one mile west-north-westward of the beacon on Rotterdam rif, and the greatest depth will be obtained by holding slightly over toward the

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2413.

Rotterdam rif side of the channel. Thence pass in mid-channel between Basing and the black can buoy about one mile westward of that islet, and proceed as directed for the swept channel. The least depth on this route is about the same as that in the swept channel, namely 3¾ fathoms ($6^{m}9$).

Vessels bound for the inner roadstead at Tandjung Pinang should steer for the light-structure situated close northward of Tanjong Batu Hitam (*Lat. 0° 54′ N., Long. 104° 26′ E.*) on the bearing 059°; at night this light changes from *white* to *red* on this bearing. The light-structures at Senggarang, or their lights at night, in line bearing 004°, lead through the narrow channel between Paku and the coastal reef extending from the Bintan shore, passing close eastward of the three black beacons, fitted with reflectors, and westward of the white beacon, also fitted with reflectors; the middle black beacon should be given a berth of about 90 feet ($27^{m}4$) on account of rocks.

Chart 1789.

LINGGA ARCHIPEL.—The description of the eastern side of the Lingga archipel, as far as was necessary for vessels proceeding to Singapore strait, was given on pages 188-190; a description of this archipelago for local navigation, with the various straits between the islands, will now be given. The western sides of Singkep and Lingga are described with Straat Berhala on pages 232-236.

There are numerous Chinese settlements throughout the islands where pepper, gambir and sago are cultivated; there are also a number of sawmills, and timber and charcoal are exported chiefly to Thailand, via Singapore. The Malay and Buginese inhabitants are mainly occupied in the fishing industry and building praus for Chinese traders.

Singkep.—Singkep is the most important island of the archipelago owing to the tin mines it contains; the main establishment of the company exploiting these mines is situated at Dabo, on the eastern coast of the island. Singkep is hilly in the north-eastern part, but otherwise the coasts and most of the interior consist of marshy plains, with here and there an isolated hill. Landjut (Lanjut), 1,685 feet ($513^{m}6$) high, situated about 5½ miles west-north-westward of Tanjong Tidja (Tija), the eastern extremity of the island, is the highest peak; farther southward are the lower, but more prominent hills Tjina (China), Terap and Labu, 1,272, 1,401 and 1,430 feet ($387^{m}7$, $427^{m}0$ and $435^{m}9$) high, respectively. Manindjut (Maninjut), in the south-eastern part of the island, is an isolated hill, 553 feet ($168^{m}6$) high, with a round summit. Tanjong Buku, the southern extremity of Singkep, has a prominent hill, 450 feet ($137^{m}2$) high, on it; Porok, a hill 486 feet ($148^{m}1$) high, about 3 miles northward of Tanjong Buku, has a fairly sharp summit. Mentigi is a prominent hill near Tanjong Sebajur (Sebayur), the western extremity of the island, and Bidei, 681 feet ($207^{m}6$) high, is situated about 5¾ miles eastward of this point.

Southern and eastern coasts of Singkep.—Light.—Beacon.—Buoys.—Baruk baai, on the southern coast of Singkep, entered between Tanjong Buku and Tanjong Malang, about 8½ miles east-north-eastward, is shoal and of no importance to shipping; there is a narrow gully on the eastern side with depths of about 3 fathoms ($5^{m}5$). Singkep Laut eilanden consists of the four islands Keling, Tengah (Tenga), Lalang and Singkep Laut, as well as a number of

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 1789.

rocks, lying together on a reef off the entrance to Baruk baai; there is a prominent tree on Singkep Laut, the eastern island. The channel between these islands and Singkep is clear and deep, except for a small reef, which dries, lying about 7 cables north-north-westward of Keling, the western island of the group.

The eastern coast of Singkep, between Tanjong Malang and Tanjong Pa Singkep, about 10 miles north-north-eastward, is fairly thickly populated. Ridges of sand, with depths of less than 5 fathoms (9^{m}1) and with a least depth of 1¼ fathoms (2^{m}3) over them, run approximately parallel to the coast at a distance of from 2 to 7 miles offshore; between these ridges and the coast of Singkep there is a clear channel with a least depth of 3¼ fathoms (5^{m}9).

A pier, about half a mile long, extends from the coast at Dabo (*Lat. 0° 30′ S., Long. 104° 34′ E.*), situated about 1½ miles westward of Tanjong Pa Singkep; this pier is fitted with a railway track, and tin from the island is loaded here. There is a 5-ton crane on the pier. A red and a green tank are situated near the root of the pier. A light, privately maintained, is exhibited near the head of the pier. A prolongation of the pier extends about three-quarters of a cable south-eastward from the light-structure.

A shoal, with a depth of 1½ fathoms (2^{m}7) over it, lies nearly one mile east-south-eastward of the head of the pier. A beacon, surmounted by a white cylinder, stands about 4 cables southward, and there are several mooring buoys about half a mile south-eastward, of the pier head.

Dabo is the headquarters of a Government official.

Caution.—Owing to probable obstructions and the activities of the tin dredgers it is inadvisable to anchor within the 3-fathom (5^{m}5) line off Dabo.

The coast between Tanjong Pa Singkep (*Lat. 0° 30′ S., Long. 104° 35′ E.*) and Tanjong Sawang, about 8 miles north-north-westward, is fringed by a reef which extends as much as half a mile; the islet of Kandu lies on this reef about 2¼ miles north-north-eastward of Tanjong Pa Singkep. A drying sandbank is situated about 2½ miles north-eastward of Tanjong Pa Singkep and 1½ miles offshore. A sandbank, with depths of less than 3 fathoms (5^{m}5), and one portion which dries, extends fully 5 miles eastward from Tanjong Sawang, and there are depths of less than 6 fathoms (11^{m}0) for as much as 10½ miles off this point; a depth of 3¾ fathoms (6^{m}9) lies about 7½ miles east-south-eastward of the point.

Northern coast of Singkep.—Islets.—Dangers.—Beacons.—The northern coast of Singkep between Tanjong Sawang and Tanjong Membatjang (Membachang), about 3¾ miles west-north-westward, is slightly indented, and three small reefs, which dry, lie in the middle of this bight and about half a mile offshore. Serang, an islet about 100 feet (30^{m}5) high, is about 1½ miles north-westward of Tanjong Sawang, and there are two reefs, which dry, between. Tengah (Tenga), a similar islet, lies about 1½ miles eastward of Tanjong Membatjang; a reef, which partly dries and with depths of less than 3 fathoms (5^{m}5) over the remainder, extends nearly one mile east-north-eastward from Tengah.

Tanjong Mentigi is situated about 2 miles westward of Tanjong Membatjang, and the small islet Mas lies close eastward of the former.

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Chart 1789.

Raja baai, entered between Tanjong Mentigi and Tanjong Sembilan, about 7¼ miles westward, is of little importance ; it has depths of less than 5 fathoms ($9^{m}1$) throughout, and there are some shoals, with depths of less than 3 fathoms ($5^{m}5$), in the entrance. Pelang, with several smaller islets, lies on the coastal reef which extends from the eastern side of the entrance ; Hulu is a small islet, surrounded by a reef, situated about 6 cables westward of Pelang, and about 3 cables westward of Hulu is a rock which dries. A rock, with a depth of 3 feet ($0^{m}9$) over it, lies about half a mile north-westward of Hulu and is marked by a white iron beacon. The islet of Berlak is situated about one mile eastward of Tanjong Bunta, a point about 3 miles south-south-eastward of Tanjong Sembilan. A drying reef lies about 1¼ miles eastward of Berlak, and a beacon, with a triangular topmark, stands about 2 miles east-south-eastward of the same islet and about three-quarters of a mile northward of the village at the mouth of Sungei Raja. Sekana baai, a shallow lagoon with mud shores overgrown with mangroves, is situated in the south-western corner of Raja baai, and is entered immediately westward of Tanjong Bunta ; several streams discharge into this bay. Bunta is a small islet lying nearly in the middle of the narrow entrance ; Kampong Bakong is situated on the western side of the entrance.

Straat Penuba. — Light. — Beacons. — Buoys. — Straat Penuba, between the northern coast of Singkep and Selajar (Selayar), is deep, but both entrances are somewhat obstructed by reefs, and for that reason Straat Lima, northward of Selajar, is preferable. Vessels entering the strait from eastward are recommended to use the passage between Serang and Tengah. A steep-to reef, on which are the islets Sembuang and Kekek, as well as numerous rocks, extends nearly 1½ miles east-south-eastward from the south-eastern extremity of Selajar ; there is a deep channel between this reef and Tengah, but the channel between the latter and Serang is preferable. In the western entrance two shoals, with depths of 2½ fathoms ($4^{m}6$) and 3 feet ($0^{m}9$) lie, respectively, about 1½ miles south-south-eastward and 2¼ miles south-eastward of Tanjong Pahat, the western extremity of Selajar.

Penuba (*Lat. 0° 20′ S., Long. 104° 28′ E.*), an islet 163 feet ($49^{m}7$) high, lies close under the Selajar coast and about 1¾ miles westward of Kekek. There is a narrow, but deep channel between Penuba and the Selajar coast, but the west-going stream runs with some force in the passage westward of the islet. Kampong Penuba is situated on the Selajar coast immediately westward of Penuba. There is a weak, wooden, pier here, about 165 feet ($50^{m}3$) long, where a vessel can berth with caution, making use of her own anchor and securing to trees ashore ; the bollards on or near the pier should not be used. A light is exhibited from the head of this pier ; a pier for small craft is situated close northward. The passage northward of Penuba and also southward of the two piers is marked by stakes, beacons and small buoys, privately maintained.

Anchorage can be obtained in Straat Penuba close southward of the channel along the western side of Penuba, or in this channel, in a depth of 12 fathoms ($22^{m}0$), eastward of the northernmost huts in the Chinese camp at Kampong Penuba ; in this latter position the tidal streams are somewhat less. The holding ground in the middle of

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

Straat Penuba, southward of Penuba, is bad, being rock. The maximum observed rate of the tidal stream here was 3 knots.

The limits of the roadstead are: The line drawn 029° along the south-eastern side of Penuba; the line drawn from the northern side of Tengah along the northern side of Tanjong Membatjang; the line drawn through Dadalang, a hill about 3½ miles south-south-eastward of Tanjong Membatjang, and Tanjong Djagoh, a point situated about one mile westward of Tanjong Membatjang (*Lat. 0° 20′ S., Long. 104° 29′ E.*).

Straat Lima.—Islets and dangers.—Straat Lima, between the northern coast of Selajar and the south-western extremity of Lingga, is a good channel and the fairway is deep. Two reefs, which dry, lie off Tanjong Bliung, situated on the northern side of the eastern entrance; these reefs are on the southern side of the channel leading to Daik (page 218). Basing is a small islet lying on the edge of the coastal reef which extends about three-quarters of a mile from the Lingga coast just within the eastern entrance; there are several above-water rocks on this reef. *See* views facing pages 220, 227.

Lima eilanden, lying nearly in the middle of the strait, consist of the four steep, hilly, wooded islets Lima, Buntar, Pandjang and Iju, as well as several rocks. A rocky islet, covered with vegetation, lies nearly half a mile east-north-eastward of Lima, the eastern and largest of the group. There are some rocks awash about half a mile west-south-westward of Iju, the westernmost islet.

Lukas and Beluntas are two rocky islets lying on the coastal reef which extends from the northern coast of Selajar; Beluntas, the western of the two, is about 2 miles west-south-westward of Iju. Baruk and Baruk kechil lie on the coastal reef which extends nearly 1¼ miles north-westward from the western extremity of Selajar; a rock, with a depth of 3 feet ($0^{m}9$) over it, is situated about 2 cables westward of Baruk kechil. There is a hill, 980 feet ($298^{m}7$) high, in the western part of Selajar, but it has not a very prominent summit.

Tjimbing is a small islet lying about one mile northward of Lima and on the narrow coastal reef which extends from Lingga. Labuan Dadong is another islet on the coastal reef and about 1½ miles west-north-westward of Tjimbing.

Pandan (*Lat. 0° 15′ S., Long. 104° 21′ E.*), about 2 miles north-westward of Baruk kechil, is a rocky islet covered with vegetation; sunken rocks extend fully 2 cables from its south-eastern side, but elsewhere the islet is steep-to.

The tidal streams set eastward and westward through Straat Lima, and the maximum rate observed in the western part was 1½ knots.

The tidal streams turn at about midway between the predicted times for Straat Berhala and North-eastern Approaches to Lingga Archipelago.

Directions.—Vessels making for Straat Lima from south-eastward should steer for Tanjong Labuan Dadong, the south-western extremity of Lingga, bearing 305°, and just showing south-westward of the rocky islet lying nearly half a mile east-north-eastward of Lima; this course leads in mid-channel through the eastern entrance and well clear of the coastal reef extending from the Lingga side. Thence pass northward of the rocky islet just mentioned and northward of the Lima eilanden. For bank westward of Tanjong Labuan Dadong, *see* page 235.

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Lingga.—Lingga is hilly in the northern part, and mountainous in the south-western part, where Gunung Daik (Lingga peak) rises to a height of 3,954 feet (1,205^{m}2) in what Horsburgh describes as "two peaks rising like spires from the summit of the mountain," and is very prominent. Sepintjan (Sepinchan), about 2¾ miles north-eastward of Lingga, has a flattish top 3,368 feet (1,026^{m}6) high; Batu Gadjah (Gaja), close eastward of Sepintjan, has a grey **Y**-shaped patch on its eastern side. *See* view facing page 200.

There are no rivers of any importance. Sungei Daik, on the southern coast, is navigable for some distance by praus; Daik, the only village of any consequence, is situated at the mouth of this river.

The western side of Lingga is described with the Inner route on page 235.

Southern side of Lingga.—Off-lying islets and dangers.—Light.—Beacons.—Several islets and numerous reefs lie off the southern coast of Lingga between Tanjong Bliung and Daik, about 7 miles east-north-eastward. The islet of Djahan is close eastward of Tanjong Bliung. Tanjong Lebu is situated about 1¾ miles north-eastward of Tanjong Bliung; there is a small islet off the point and a village lies close northward of the same point at the mouth of Sungei Lebu. Two drying reefs lie about 6 cables eastward and one mile south-eastward of Tanjong Lebu.

Mepar, an islet surrounded by a reef which extends nearly a quarter of a mile from its western and southern sides, is situated about 4 cables south-westward of Tanjong Butun, a point nearly 4½ miles east-north-eastward of Tanjong Bliung; there is a hillock on the south-eastern extremity of the islet. The islet of Putjong lies about 3 cables north-westward of Mepar. Badas, a small islet nearly one mile southward of Mepar, is surrounded by a reef which extends fully a quarter of a mile from its eastern and western sides. Kelombok, also surrounded by a reef, is a hilly islet lying nearly 2½ miles eastward of Badas; a white iron beacon, surmounted by a ball, stands on the north-western edge of the reef surrounding Kelombok. About midway between Badas and Kelombok is a reef which dries, and its eastern extremity is marked by a black iron beacon surmounted by a cone. Hantu, nearly 1¼ miles eastward of Kelombok, is surrounded by a reef which extends about 3 cables from its northern side. All these islets, and also the two reefs southward of Tanjong Bliung, lie on a narrow ridge with depths of less than 3 fathoms (5^{m}5). Along the northern side of this ridge there is a passage with depths of fully 5 fathoms (9^{m}1) in the fairway, but it is only about 1½ cables broad between Tanjong Bliung (*Lat. 0° 16′ S., Long. 104° 31′ E.*) and the two reefs lying southward of this point. There are several rocks on the northern side of the passage; the westernmost of these, with a depth of 3 feet (0^{m}9) over it, lies about half a mile southward of Mepar, and nearly one mile east-south-eastward of this islet is a rock awash. Some rocks awash lie nearly one mile west-north-westward of the northern extremity of Kelombok, and a black iron beacon surmounted by a cone stands close eastward of them. Vessels with local knowledge, whose draught does not permit them to cross the ridge between Kelombok and the reef about one mile westward, make use of this passage when proceeding to Rede Lingga. Small vessels bound for Daik can cross the ridge westward of Kelombok by steering 030° from a position about 3½ cables southward of the black

Charts 2757, 2660a, 941a, 1263.

beacon marking the reef about one mile westward of Kelombok. Rede Lingga includes the area of water in the vicinity of Tanjong Butun; anchorage can be obtained, in a depth of about 5 fathoms ($9^{m}1$), northward of Badas, and also northward of Kelombok. There are numerous fishing stakes in this vicinity, and care must be taken not to confuse them with the beacons.

Mengalang, fully one mile south-eastward of Kelombok, is a small islet surrounded by a reef; a reef, which dries, lies about midway between these two islets. There are several stony patches between 1½ and 2¾ miles southward of Mengalang; the southernmost patch, Sebangga Laut, with a least depth of 4¼ fathoms ($7^{m}8$) over it, lies nearly 2¾ miles south-south-westward of Mengalang; Sebangga, with a least depth of 2½ fathoms ($4^{m}6$) over it, and Ular, with a depth of 2¾ fathoms ($5^{m}0$), are situated half a mile northward and north-eastward, respectively, of Sebangga Laut; and Titi Mengalang, with a least depth of 2¾ fathoms ($5^{m}0$) over it, is about 2 miles south-south-eastward of Mengalang. Several 3-fathom ($5^{m}5$) patches lie between one and 3 miles east-south-eastward of Mengalang (*Lat. 0° 17′ S., Long. 104° 39′ E.*). A 2½-fathom ($4^{m}6$) patch lies 1½ miles south-south-westward of Mengalang; and there is a 2½-fathom ($4^{m}6$) patch about 1½ miles south-south-eastward of Badas. A shoal, with a least depth of 3¾ fathoms ($6^{m}9$), lies about 4½ miles south-south-eastward of Mengalang; depths of less than 6 fathoms ($11^{m}0$) extend for nearly 2 miles south-south-eastward from this shoal. Another shoal, with a depth of 4½ fathoms ($8^{m}2$) over it, lies about 5½ miles south-eastward of Mengalang and there are several patches, with depths of from 3¾ to 5 fathoms ($7^{m}0$ to $9^{m}1$), between this last shoal and Titi Mengalang.

Daik, the principal village of Lingga, is inhabited by Chinese and Malays, and is situated a short distance within the mouth of Sungei Daik, which flows out about 2½ miles north-eastward of Tanjong Butun. The channel through the coastal bank leading to the river has a depth of about 3 feet ($0^{m}9$), and is marked by three stake beacons, privately maintained, to be passed on the starboard hand when entering. There is a white stone pillar, not visible from seaward, on the western side of the mouth of the river, and close southward of it is a post from which a light is exhibited.

Eastward of Daik the coast is free from dangers. Tanjong Buar, about 14 miles east-south-eastward of Daik, and Tanjong Goroh, about 4 miles east-south-eastward of Tanjong Buar, are prominent points. Batu Kapal, with a depth of 5 feet ($1^{m}5$) over it, lies about 2 miles south-eastward of Tanjong Buar, and is usually marked by tide-rips. Batu Maresoh (Mareso), nearly one mile south-eastward of Tanjong Goroh, is just visible at high water. Kokau (Kakau) is a hilly islet situated about half a mile eastward of Tanjong Goroh.

Tanjong Djang, with the light on it, as well as Ilchester bank, have been described on page 188. The bay immediately westward of this point is too shoal to be of any importance. Semulan Darat, a reef awash, lies about three-quarters of a mile westward of Sunsa (page 188).

North-eastern side of Lingga.—Off-lying islands and dangers.—The coast between Tanjong Djang and Tanjong Takih (Taki), a prominent point about 14½ miles north-westward, is mostly hilly, and several islets and dangers lie off it; Piatu, a hill 377 feet ($114^{m}9$) high, is situated about 4 miles west-north-westward of the light-structure on Tanjong Djang, and a reef, which dries, lies about 3 cables offshore here. Selentang, the outermost islet, Budjang and the Kongka eilanden have been described on page 189. Tanjong Liang is situated nearly 6 miles north-westward of Piatu, and is fringed by a bank which extends about 2 cables; Sungei Liang flows out at this point.

Godjong (Gojong), about 1¾ miles north-eastward of Tanjong Liang, is a low, wooded islet, surrounded by a reef except on its south-western side; depths of less than 5 fathoms ($9^{m}1$) extend for fully 1½ miles south-eastward from Godjong.

Malang Bilang, about three-quarters of a mile south-eastward of Godjong, is a prominent rock 9 feet ($2^{m}7$) high, and Pasir Pandjang (Panjang), about the same distance north-eastward of that islet, is a sandbank which dries. The passage between Tanjong Liang and Godjong is safe, and has depths of over 5 fathoms ($9^{m}1$). The passage between Godjong and Budjang, and that between Budjang and Kongka besar, should not be attempted. In the latter passage is Terumbu Tjawan (Chawan), a reef which dries, lying about half a mile north-westward of Budjang; a group of above-water rocks about 1¾ miles north-westward of Budjang; and Maras, two rocks covered with vegetation, lying together on a reef about 2½ miles north-westward of the same islet.

Hantu (*Lat. 0° 08′ S., Long. 104° 49′ E.*), a low sandy islet covered with vegetation, lies nearly half a mile north-north-westward of Tanjong Takih, and a reef, which dries, extends about half a mile north-eastward from it. Penoh Laut is an islet about 3 miles northward of Tanjong Takih and three-quarters of a mile southward of Kongka kechil; a sandbank, which dries, lies about 3 cables south-eastward of Penoh Laut, and there is a 2¾-fathom ($5^{m}0$) patch about half a mile north-westward of the same islet. Penoh (Peno) is situated about half a mile south-eastward of Kongka kechil, and is surrounded by a reef which extends nearly three-quarters of a mile south-eastward. Seranggong, about one mile south-eastward of Penoh, is a small islet covered with vegetation and surrounded by a reef. Empoh (Empo) is an islet situated about 2¾ miles north-north-westward of Tanjong Takih and lies on the northern end of a spit, with depths of less than 3 fathoms ($5^{m}5$) over it; a rock awash lies about 3 cables south-westward of Empoh. There is a safe passage, with a least depth of 3¼ fathoms ($5^{m}9$), between Penoh Laut on the north-eastern side, and Hantu and Empoh on the south-western side.

Limbung baai.—Directions.—Limbung baai, entered between Tanjong Takih (*Lat. 0° 08′ S., Long. 104° 50′ E.*) and Tanjong Lobit, about 5½ miles westward, has low, wooded shores, fringed by a sandy beach and a bank which dries out nearly a mile in places. There are several Chinese settlements on the shores, including Limbung, a village on the western side of the bay.

There are several islets in the bay, those on the bank at the head being low and wooded, namely Kekek, Barok, Telom and Seranggas, lying, respectively, about one mile north-eastward, three-quarters of a mile eastward, 3 cables northward, and 6 cables north-westward of Tanjong Seranggas, a point about 4½ miles south-westward of Tanjong Takih. Udjung (Ujung) Beting, the largest island, lies close off Tanjong Lobit and is hilly; a reef extends about one mile north-eastward

Chart 1789.

from its south-eastern extremity, and on it is Batu Hitam, a low islet. Tikus and Malang Tikus are wooded rocks surrounded by reefs situated about one mile southward of Udjung Beting. Pongo and Basing lie between Udjung Beting and the western shore of the bay.

Terumbu Terap are three sunken rocks lying from a half to one mile south-westward of Hantu. Malang Sekati is a reef which dries about 1½ miles eastward of Tikus.

Caution must be exercised when entering Limbung baai. From eastward, a vessel can pass between Hantu and Empoh, steering on Batu Hitam so as to clear the reef which extends northward from Hantu and to avoid Terumbu Terap; then steer for a position just southward of Tikus, sounding continuously so as to avoid the reef which extends about half a mile southward from Udjung Beting. There is good anchorage, in a depth of 1¾ fathoms ($3^{m}2$), about midway between Tikus and Telom.

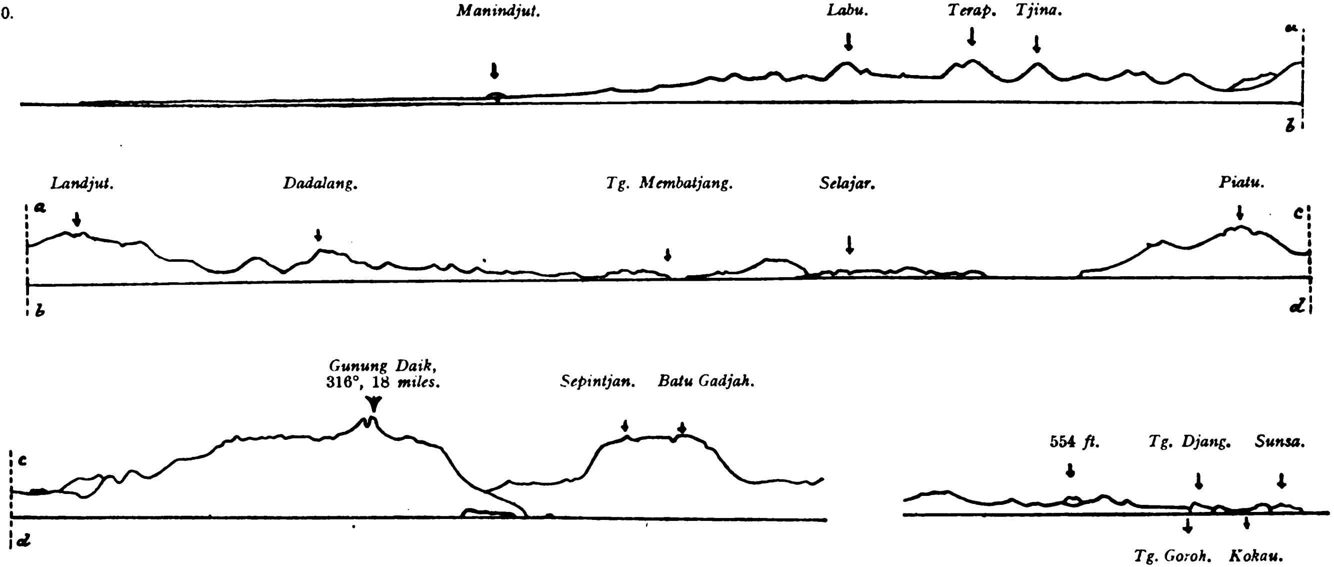
Coast.—About 5½ miles north-westward of Tanjong Lobit is the narrow entrance to Sungei Duara, a shoal inlet into which Sungei Semarong and Sungei Resun discharge; there are three villages on the northern shore of this inlet. Alut is a hilly island, rising to a height of 508 feet ($154^{m}8$), lying about 2 miles off the entrance to Sungei Duara; there is good holding ground between this island and Kongka kechil, but a reef, which dries, lies about 1¼ miles north-north-eastward of the southern extremity of Alut, and depths of less than 3 fathoms ($5^{m}5$) extend for about 1¼ miles north-westward from this reef. There is a clear channel, with a least depth of 3¾ fathoms ($6^{m}9$) in the fairway, between Alut and the coast of Lingga.

Lutong, Ileuh (Ileu), Berang, 242 feet ($73^{m}8$) high, and Berai lie, respectively, about half a mile, 1½ miles and 3 miles north-westward, and 2½ miles west-north-westward of Alut, and there is a narrow channel, with a least depth of 2¾ fathoms ($5^{m}0$) in the fairway, between these islands and the Lingga coast; an isolated patch, with a depth of 2½ fathoms ($4^{m}6$), is situated on the north-eastern side of this channel and nearly one mile westward of Lutong. Two above-water rocks lie on a drying reef about 2 cables westward of the northern extremity of Ileuh. A reef, which dries, extends about three-quarters of a mile west-north-westward from Berai. Anak Ileuh (Ileu) is an islet lying nearly 1½ miles northward of Lutong; depths of less than 3 fathoms ($5^{m}5$) extend for about 6 cables east-south-eastward from this islet. A 2¾-fathom ($5^{m}0$) patch lies about one mile south-eastward of Anak Ileuh (*Lat. 0° 01′ S., Long. 104° 41′ E.*), and there is a 2½-fathom ($4^{m}6$) patch about 7 cables northward of the same islet.

Kentar, with the light on it, has been described on page 189. A reef, which only covers at exceptionally high water, lies about 1½ miles southward of the south-western extremity of Kentar, and a narrow ridge, with depths of from 1¾ to 3 fathoms ($3^{m}2$ to $5^{m}5$) over it, extends nearly 2½ miles eastward from this reef; the depths between this ridge and Kentar are very irregular. A large drying reef, with several above-water rocks on it, lies about half a mile west-south-westward of Blading (page 189); and there is a 3¾-fathom ($6^{m}9$) patch about 2 miles south-westward of the same island. The tidal streams may set a vessel strongly in or out of the passage between Kentar and Blading (*Lat. 0° 01′ S., Long. 104° 50′ E.*), and also in that between Blading and Kongka besar.

Charts 2757, 2660a, 941a, 1263.

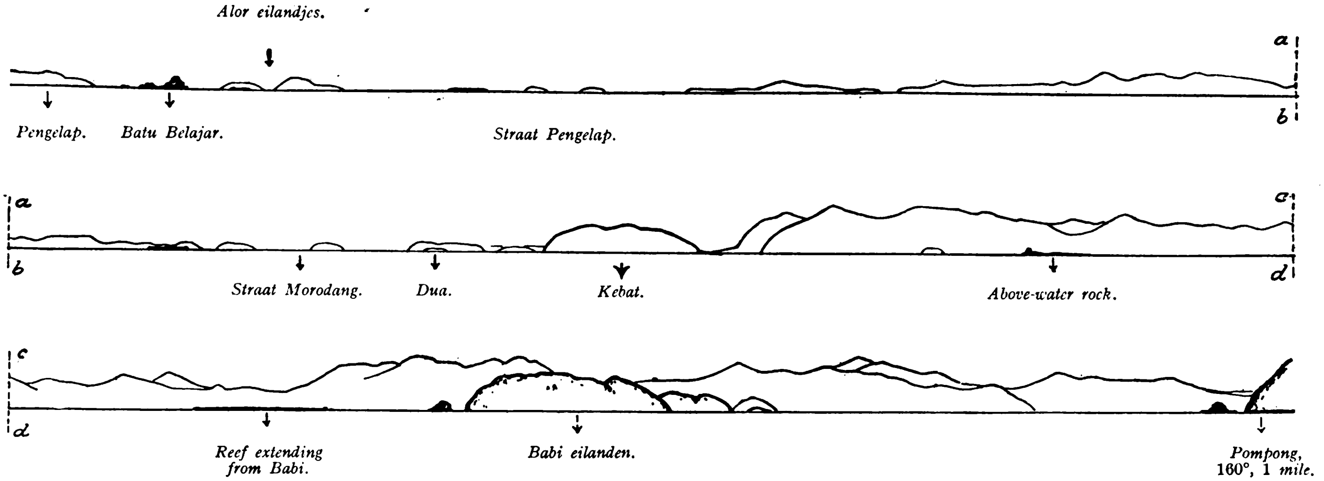
To face page 220.



View, in 4 parts, of eastern approach to Straat Lima.

(*Original dated* 1949.)

To face page 221.



View, in 3 parts, of western entrances to Straat Pengelap and Straat Morodang.

(*Original dated* 1949.)

Chart 1789.

Straat Dasi.—Beacons.—Straat Dasi is the narrow passage separating the northern extremity of Lingga from the south-eastern extremity of Bakung. The strait can only be navigated with local knowledge, and the west-going tidal stream may attain a rate of from 4 to 5 knots; there are often heavy tide-rips and whirlpools westward of the western entrance to this strait. A bight on the northern coast of Lingga is almost entirely occupied by the islands Talas and Botot, which form the southern side of the strait; Buli, Benut, Gadjah (Gaja) and other islands off the south-eastern end of Bakung form the northern side. A rock awash lies in the centre of the southern entrance to the strait between Buli and Benut, and there is a similar rock in mid-channel in the northern entrance; the reefs and shoal water extending from either side narrow the northern entrance to less than one cable in width.

Straat Dasi, although narrow, is deep in the fairway and the sides are steep-to. There is an islet close off the north-eastern extremity of Lingga and a 5-fathom ($9^{m}1$) patch lies on the northern side of the channel about 6 cables westward of the same point. A reef, with a depth of 3 feet ($0^{m}9$) over it, lies on the southern side of the strait and about 4 cables west-south-westward of the northern point of Talas; it is marked by an iron beacon surmounted by a ball. The channel between this beacon and the islet north-westward is only about one cable in width. A reef, which dries, lies on the northern side of the strait and nearly half a mile southward of Gadjah; a black iron beacon surmounted by a cone marks its southern side. Depths of less than 5 fathoms ($9^{m}1$) extend about 3 cables north-westward from the north-western extremity of Talas; a drying reef, with some above-water rocks on it, lies about 4 cables west-south-westward of the same point, and midway between is a rock, with a least depth of 2 feet ($0^{m}6$) over it. A reef, with a depth of one foot ($0^{m}3$) over it, is situated nearly in the middle of the western entrance of the strait, and midway between this reef and the southern extremity of Bakung is a $3\frac{1}{4}$-fathom ($5^{m}9$) patch. Two 5-fathom ($9^{m}1$) patches lie about $1\frac{1}{2}$ miles west-north-westward and one mile west-south-westward of the north-western extremity of Lingga.

Channels between Sebangka and Bakung.—Lights.—Sebangka has been described on page 190. Bakung has a few hills on it about 300 feet ($91^{m}4$) high, and the western side of the island is fairly steep; the eastern side of the island is overgrown with mangroves. There is a deeply penetrating inlet on the northern side, which communicates with Straat Tjempah (page 237) by a narrow passage named Selat Lepu; there are so many islets, reefs and rocks here, however, that navigation is practically impossible.

Close off the eastern side of Bakung is a chain of islands, the principal of which are Buli, Rekas, Tapai and Tigi. Between this chain and Sebangka is another chain of islands, all tolerably high, which divides this area into two main channels; the western of these channels is mostly used by Chinese praus carrying timber, and the eastern, under the Sebangka shore, is regularly used by small vessels proceeding from Daik to Straat Temiang (page 224), or vice versa. The principal islands in the chain midway between Bakung and Sebangka are Udjung Kaju (Ujung Kayu), Mamut, 387 feet ($118^{m}0$) high, and Tapeuh (Tapeu).

The islands and dangers in the southern approach to the eastern

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

channel have been described with the north-eastern side of Lingga, commencing at page 189. Senajang (*Lat. 0° 02′ N., Long. 104° 39′ E.*) is an island lying close off the western coast of Sebangka and about 2½ miles north-westward of Tanjong Gantong, the south-eastern extremity of that island. A light is exhibited on the south-eastern point of Senajang, and another light is exhibited on its western side. Burung is an islet 140 feet ($42^{m}7$) high, lying about 2½ miles westward of the south-eastern point of Senajang, and a reef extends nearly three-quarters of a mile south-eastward from it; a small coral reef, which dries, lies about one mile westward of Burung, and there is a 5-fathom ($9^{m}1$) patch about three-quarters of a mile westward of the same islet. Lokong, an islet 81 feet ($24^{m}7$) high, surrounded by a reef, is about 8 miles north-westward of Burung in the middle of the eastern channel and about 6 cables off the eastern coast of Mamut; Monong is a fairly well populated island lying close under the Sebangka coast eastward of Lokong.

Charts 2413, 1789.

The usual route out of the eastern channel is through the narrow Selat Ajer Radja, which lies between Setemu, an island close off the north-western extremity of Sebangka, and Pasir Gagah (Gaga), an island close north-westward. A reef, with an islet on it, extends about 3 cables northward from the north-western point of Setemu, and the tidal streams are sometimes very strong in this strait. A northerly course is then steered so as to pass at least 6 cables eastward of Selih (Seli) (*Lat. 0° 17′ N., Long. 104° 27′ E.*), a small islet, surrounded by a reef, lying about 3½ miles northward of the south-eastern extremity of Pasir Gagah, and also between the rock awash about 1¼ miles south-eastward of Selih and the 3¾-fathom ($6^{m}9$) patch about 1¼ miles south-south-eastward of the same islet. A reef, which dries, lies about 3 cables eastward of Selih. Local knowledge is essential for the navigation of this part of the eastern channel.

Chart 1789.

The western channel, which requires local knowledge, is deep in the fairway, but the northern entrance is obstructed by a narrow shoal, with a least depth of 2 fathoms ($3^{m}7$), which runs in an east-south-east and west-north-west direction, leaving only a narrow passage, with depths of over 5 fathoms ($9^{m}1$) on either side, but a rock, with less than 6 feet ($1^{m}8$) over it, lies in the western of these two passages, and there is a 3½-fathom ($6^{m}4$) patch in the eastern one. Bugei kechil and Bugei besar, two islets fringed by reefs, lie in the southern entrance to the western channel about one mile west-south-westward and nearly 1½ miles west-north-westward, respectively, of the south-eastern point of Udjung Kaju (page 221). Drying reefs extend for about three-quarters of a mile east-south-eastward from Bugei kechil and a rock awash lies about 3 miles west-north-westward of Bugei besar. There is a deep channel both north-eastward and south-westward of these islets, the south-western one being the wider and easier channel. A bank, with depths of less than 3 fathoms ($5^{m}5$) over it, lies off the north-eastern coast of Buli and the island immediately north-westward of it; there is a depth of 2¼ fathoms ($4^{m}1$) on this bank about 7 cables north-north-eastward of the south-eastern extremity of Buli, and a depth of 2 feet ($0^{m}6$) lies about 9 cables west-south-westward of Bugei besar.

Charts 2757, 2660a, 941a, 1263.

Chart 2413.

Temiang group.—The Temiang group consists of the four large islands Saga, Batang, Benku and Temiang, and several smaller islands, lying north-westward of Bakung and Sebangka ; all the islands are hilly. The passage southward of this group is only navigable by vessels with local knowledge.

Batang and Benku, the two middle islands of the group, are connected to each other by a reef which dries. Batang has an isolated hill, 636 feet ($193^{m}8$) high, on its north-western end. Benku has two hills in the north-eastern part, and there are several islets on the coastal reef. Saga is separated from the south-western side of Batang by the narrow Selat Saga. Tekoleh, an island with a village on its eastern side, lies close off the south-eastern extremity of Saga ; a narrow passage between the coastal reef surrounding Tekoleh and a large reef, which dries, eastward of the island, gives access to the village. A rock, with a least depth of one foot ($0^{m}3$) over it, lies about half a mile southward of Tekoleh (chart 1789).

Penah (Pena) (chart 1789) is about 1½ miles south-westward of Tekoleh, and from this islet a chain of islets and reefs extends nearly 3 miles north-westward. Ompok, 216 feet ($65^{m}8$) high, about 1½ miles south-westward of Saga, is the largest of a chain of islets and reefs running nearly parallel to the south-western coast of Saga ; these islets and reefs extend for about 1¼ miles south-eastward and three-quarters of a mile north-westward from Ompok (*Lat. 0° 16′ N., Long. 104° 19′ E.*).

Temiang, the largest island of the group, is separated from Batang and Benku by Selat Pandjang, a narrow passage only navigable for praus, and has some prominent hills on it. Temiang, a fairly sharp peak 567 feet ($172^{m}8$) high, is situated in the north-eastern part of the island ; Piang, about one mile southward of Temiang, has two peaks ; Benaja (Beraja), in the middle of the south-western side of the island, is a table-land with three peaks close together, the middle and highest being 731 feet ($222^{m}8$) high.

Peredi is an island lying on the coastal reef which extends from the south-eastern point of Temiang ; Reman, consisting of two islets lying on a reef, is situated close northward of Peredi. Rekon, a small islet surrounded by a reef, on which is an above-water rock, lies close offshore and about one mile north-westward of Reman.

Pintu, a hilly island rising to a height of 406 feet ($123^{m}7$) near its western extremity, is almost connected to the north-western extremity of Temiang ; an above-water rock lies close off its northern coast, and there is a reef which dries about a quarter of a mile northward of its western extremity. Kebat, an island 209 feet ($63^{m}7$) high, is situated about 3 cables north-westward of Pintu, and a rock, which dries, lies about 3 cables northward of the former. A rock, with less than 6 feet ($1^{m}8$) over it, lies about one cable southward of the south-eastern extremity of Kebat, and there is an above-water rock midway between this islet and Pintu. Babi eilanden lie close together on a long, narrow reef about 1½ miles south-westward of Kebat, with foul ground between ; the north-western islet is 124 feet ($37^{m}8$) high. An above-water rock is situated about three-quarters of a mile north-westward of the north-western islet of the group ; a small reef, with a depth of 3 feet ($0^{m}9$) over it, lies about midway between the south-eastern of the Babi eilanden and the coastal reef which extends from the northern

Charts 1789, 2757, 2660a, 941a, 1263.

side of Benku. Pompong, an island 403 feet (122^{m}8) high, surrounded by a narrow reef, is situated about three-quarters of a mile westward of the Babi eilanden. A rock awash lies about 3 cables off the north-western end of Pompong; there is an above-water rock, surrounded by a reef, nearly one mile south-eastward of the same island, and a drying reef lies about 3 cables north-north-eastward of this rock.

Batu Belajar (Belayar), about 2½ miles northward of Pompong (*Lat. 0° 22′ N., Long. 104° 16′ E.*), consists of two rocks, several feet high, and a smaller rock, lying close together on a reef which dries; another rock above water lies close northward of this reef; and there is a rock, almost awash, about a quarter of a mile westward of the reef. In 1952, H.M.S. *Challenger* reported that unexamined depths of 6 and 6½ fathoms (11^{m}0 and 11^{m}9) existed about 7 cables north-eastward and 6 cables south-south-westward of Batu Belajar.

Straat Temiang.—Dangers.—Straat Temiang, between the northern coast of Temiang and the adjacent islands on the south-western side, and Dujung, Medang kechil, Medang besar and the Dua eilanden on the north-eastern side, is deep and has only two dangers in it. The 4¾-fathom (8^{m}7) patch, on the south-western side of the eastern approach to this strait, has been mentioned on page 190; there is a 3-fathom (5^{m}5) patch about 1¾ miles eastward of Selih (page 222).

Middel klip (Pinnacle rock), which is awash, lies nearly in the middle of the eastern entrance to Straat Temiang and about 1½ miles eastward of Rekon; it generally breaks, and can be passed on either side. Dujung (Duyung) is a hilly island lying with its south-western extremity nearly 2½ miles north-eastward of Rekon; its eastern point is high and rocky. Dasi and Salamanang lie close together on a reef, and are separated from the northern side of Dujung by a narrow channel with depths of from 3¾ to 4¾ fathoms (6^{m}9 to 8^{m}7); Botjong (Bochong) is a rock close off the north-eastern side of Salamanang.

Medang kechil is about 1½ miles west-north-westward of Dujung, and there are some reefs, which dry, between them; a rock lies about a quarter of a mile southward of the southern point of Medang kechil. Medang besar lies close northward of Medang kechil; both these islands are low, covered with mangroves, and surrounded by reefs which dry. A 4¾-fathom (8^{m}7) patch lies nearly one mile north-westward of the western extremity of Medang besar (*Lat. 0° 23′ N., Long. 104° 25′ E.*).

Merodong, the highest island of this group, is situated about half a mile north-eastward of Medang besar, and on the south-eastern side rises steeply to a peak, 606 feet (184^{m}7) high, which slopes down gradually north-westward, where it forms a shoulder; this peak is a good landmark for vessels making Straat Riouw.

The channels between the islands just described, and between them and Mesanak (*see* page 225), are encumbered with reefs and shoals, and are unsuitable for navigation.

The southern of the Dua eilanden, which is 111 feet (33^{m}8) high, lies about 2¼ miles west-north-westward of Medang besar and its southern point is rocky; the northern islet is lower than the southern, and both are surrounded by reefs. There is a 3-fathom (5^{m}5) patch about 3 cables eastward of the southern islet.

A small reef, with a depth of 1¾ fathoms (3^{m}2) over it, lies about one mile south-south-eastward of the southern of the Dua eilanden and nearly in the middle of Straat Temiang; as this reef was only discovered, in 1925, by a vessel striking it, it is probably not marked by breakers or discoloration. Vessels can pass from Straat Temiang into Straat Merodong, or vice versa, by the passage between the southern of the Dua eilanden and Medang besar, with a least depth of about 9 fathoms ($16^{m}5$) in the fairway, taking care to avoid the reef just mentioned and also the 4¾-fathom ($8^{m}7$) patch lying nearly one mile north-westward of Medang besar.

A 5½-fathom ($10^{m}1$) patch lies about 6 cables north-westward of the northern Dua eilanden. A reef of stones and coral, having an islet on its southern end and an above-water rock on its northern part, is situated about 1¼ miles north-westward of the northern of the Dua eilanden; there are often heavy tide-rips in the channel between them. Close north-westward of this reef is another similar reef, on which is Boom rots, a prominent bare rock 14 feet ($4^{m}3$) high. A coral patch, with a depth of 4¼ fathoms ($7^{m}8$), lies nearly one mile north-westward of Boom rots (*Lat. 0° 26′ N., Long. 104° 20′ E.*).

Straat Merodong.—Dangers.—Straat Merodong lies between Mesanak and Merodong on the southern side, and a group of islands occupying a circular area about 5 miles in diameter on the northern side. *See* view on chart 2413 and view facing page 221.

Mesanak has a hilly ridge running the entire length of both arms, the summit of the island, 347 feet ($105^{m}8$) high, being in the north-western part. It is surrounded by a reef, which extends as much as three-quarters of a mile from the eastern side. Kuju is a fairly high islet situated on the coastal reef which extends from the eastern point; a 4¼-fathom ($7^{m}8$) patch lies nearly 2 miles southward of Kuju. There is an islet on the coastal reef close off the northern extremity of Mesanak; depths of less than 6 fathoms ($11^{m}0$) extend for about 1¼ miles westward from this islet, and a 5½-fathom ($10^{m}1$) patch lies about 1¼ miles north-eastward of the same islet. Njamuk, an island 180 feet ($54^{m}9$) high, is about 1¼ miles south-eastward of the southern extremity of Mesanak, with foul ground between; it is surrounded by a reef, which extends about one mile from its north-eastern side. A 5-fathom ($9^{m}1$) patch lies about 1¼ miles westward of Njamuk. An extensive shoal, with depths of less than 5 fathoms ($9^{m}1$) and a least depth of 2½ fathoms ($4^{m}6$), lies with its shoalest head about 2¼ miles north-eastward of the eastern extremity of Mesanak; between Mesanak and this shoal there are irregular depths of from 5 to 12 fathoms ($9^{m}1$ to $21^{m}9$), and depths of less than 6 fathoms ($11^{m}0$) extend up to 2 miles eastward from the shoalest part of the above shoal.

Rifleman rif, with a least depth of 2 fathoms ($3^{m}7$), lies on the northern side of the eastern entrance to Straat Merodong and about one mile eastward of Benan, the easternmost island of the group which forms the northern side of the strait. Good anchorage can be obtained near this shoal in depths of from 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$). There is a 6-fathom ($11^{m}0$) patch about 2¾ miles east-north-eastward of Rifleman rif.

The islands of the group forming the northern side of Straat Merodong are separated from each other by narrow channels much obstructed by reefs. Katang Lingga, the northernmost island, has a hill on the northern part 235 feet ($71^{m}6$) high, but the southern part is low; it is surrounded by a reef, but can be approached fairly closely on its northern side. A reef, which dries, and is generally marked by surf, lies about half a mile westward of Katang Lingga. Titampan, the south-western and highest island of the group, has a sharp summit, 351 feet (107^{m}0) high. Daleh is the southernmost island, and there are several dangers to be avoided in this neighbourhood, *see* below. Reefs extend nearly one mile north-north-eastward from Merodong, on the southern side of the strait, and vessels must keep well clear northward of the shoals between this island and Mesanak. A reef, which dries, and is generally marked by tide-rips or surf, lies about a quarter of a mile south-eastward of Daleh, and there is a similar reef about half a mile south-westward of this island; Batu Belajar, bearing 270°, and well open southward of the islet north-westward of the Dua eilanden, leads clear southward of these two reefs.

There is a clear passage, with a least depth of about 7½ fathoms (13^{m}7), between Boom rots and Titampan.

Straat Pengelap.—Islets and dangers.—Straat Pengelap lies between the group of islands which forms the northern side of Straat Merodong, on the eastern side, and Pengelap, with the adjacent islands, on the western side. *See* view facing page 221.

Alor eilandjes (*Lat. 0° 28′ N., Long. 104° 18′ E.*), the southernmost of the group forming the western side of the strait, consists of some rocky islets lying on a reef; the southern and largest islet is 148 feet (45^{m}1) high. Dedap is a hilly island lying with its southern extremity about 2 miles north-westward of the largest of the Alor eilandjes; it is surrounded by a reef, which extends about half a mile from its southern point and has some rocky islets on it. Two rocks, which dry, lie fully one mile south-south-eastward of Dedap. Pengelap, the largest island of the group, is hilly, attaining a height of 262 feet (79^{m}9) in the northern part, and is surrounded by a reef, with a few white beaches on the eastern side; an above-water rock lies about 2 cables off the southern point. The passage between Pengelap and Dedap is clear, except for a reef, which dries, lying close off the western coast of the former and about one mile southward of its northern extremity, but vessels are advised against using it, as the tidal streams are strong. A 5-fathom (9^{m}1) patch lies fully half a mile eastward of the middle of the eastern coast of Pengelap, and about 6 cables northward of this patch is a 4-fathom (7^{m}3) patch.

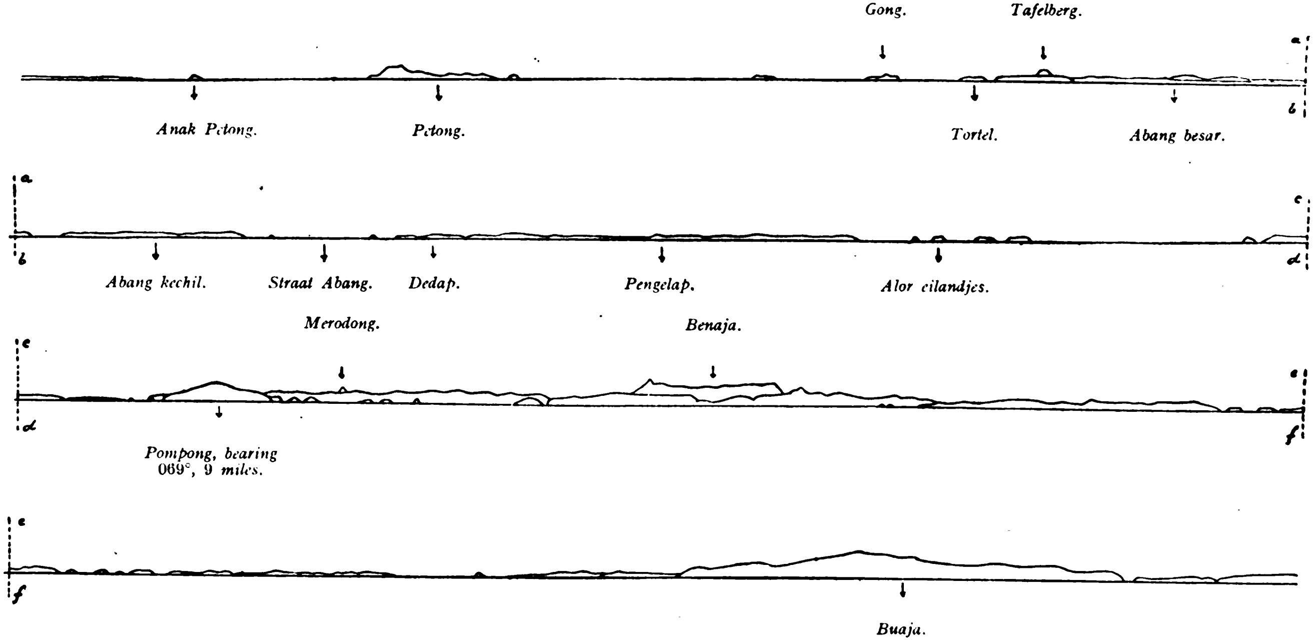
A 5½-fathom (10^{m}1) patch, the position of which is approximate, was reported, in 1951, about one mile south-eastward of the middle of the largest Alor island.

A narrow bank, with depths of from 6 to 9 fathoms (11^{m}0 to 16^{m}5), extends about 2 miles north-north-eastward from a position about one mile north-eastward of the southern point of Pengelap. On the southern end of this bank is a patch of sand with a depth of 2¼ fathoms (4^{m}1), and on the northern end is Middenklip, a rock awash; there are strong tide-rips on the bank, but the rock is seldom marked by surf.

The Selanga eilandjes lie on a reef on the eastern side of the strait, and can be approached fairly closely; the southern islet is 114 feet (34^{m}7) high. A large white rock, with a reef, which dries, close north-eastward of it, lies between these islets and Tokong, an island 220 feet (67^{m}1) high, situated about 1½ miles south-westward of Katang Lingga.

Udiep, an islet 124 feet (37^{m}8) high, is nearly 1½ miles east-north-

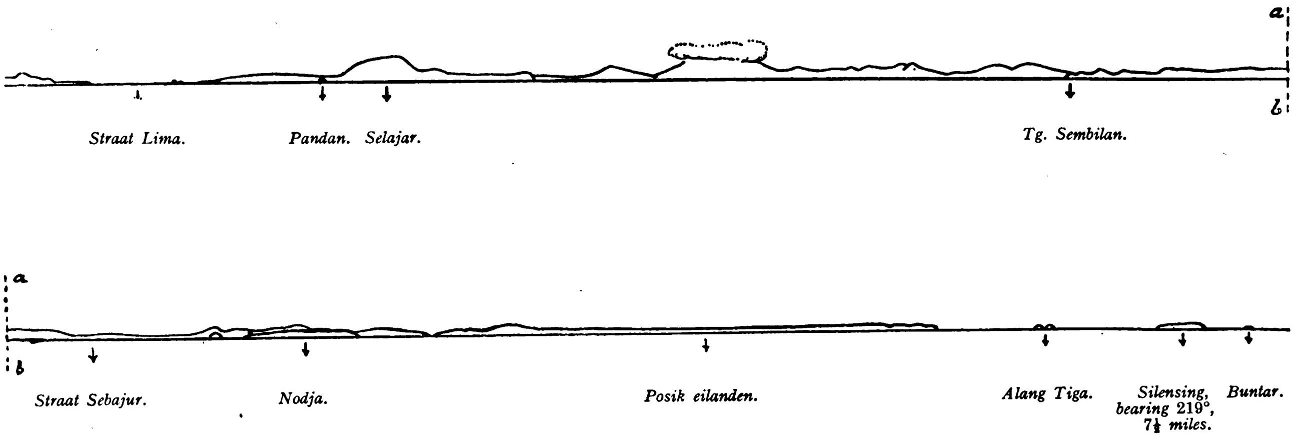
To face page 226.



View, in 4 parts, of the southern approach to Straat Abang, from south-westward.

(Original dated 1929.)

To face page 227.



View, in 2 parts, of the western entrance to Straat Lima.

(*Original dated* 1929.)

Chart 2413.

eastward of the northern extremity of Pengelap. Good anchorage can be obtained southward of this islet, off the eastern side of Pengelap.

Batu Belajar, bearing 224°, and well open south-eastward of the Alor eilandjes, leads through Straat Pengelap.

Owing to the uneven nature of the bottom the tidal streams, near spring tides, cause whirls and overfalls which are somewhat alarming to strangers; the strait is, however, clear except for the sand patch and Middenklip on the western side of the fairway, also the reported 5½-fathom ($10^{m}1$) patch about one mile south-eastward of the Alor eilandjes, and is easy to navigate.

Straat Abang.—Islets and dangers.—Straat Abang, between Dedap and Pengelap on the south-eastern side, and Abang kechil on the north-western side, is reduced to a breadth of about three-quarters of a mile by the reefs on either side, but is clear and deep in the fairway. *See* views facing pages 226, 228.

The Sawang eilandjes are two wooded islets lying on a reef about half a mile north-westward of Dedap. There is a rock, with a depth of less than 6 feet ($1^{m}8$) over it, about 2 cables north-north-eastward of the northern islet, and a rock awash lies about one cable north-eastward of this islet. There is no safe passage between these islets and Dedap (*Lat. 0° 30′ N., Long. 104° 16′ E.*).

The Sepintu eilandjes, on the northern side of the strait, are two wooded, rocky islets. A rock awash lies fully one cable southward of the southern islet, and there is a similar rock about the same distance northward of the northern islet.

Abang kechil is a thickly wooded, hilly island surrounded by a reef which extends about half a mile from the north-eastern side and has an islet on it. Njiur eilandjes are a group of bare rocks lying on the southern part of a large reef, which dries, off the eastern side of the island; an above-water rock lies about a quarter of a mile south-south-eastward of the southern of these rocks.

Abang besar, also thickly wooded and hilly, rises to a height of 291 feet ($88^{m}7$) in its north-western part; it is surrounded by a reef which extends about one mile from its south-eastern coast and on this portion is an islet. It is separated from Abang kechil by a narrow channel only suitable for praus; a reef, which dries, lies in the middle of the southern entrance, and about three-quarters of a mile south-eastward of the southern extremity of Abang besar. A 4½-fathom ($8^{m}2$) patch and a 6½-fathom ($11^{m}9$) patch are situated about one mile south-eastward and 1¼ miles southward, respectively, of the same point. A rock above water lies about half a mile east-south-eastward of the northern extremity of the island. Tortel (*Lat. 0° 35′ N., Long. 104° 11′ E.*) is an islet close off the western coast and about 1¾ miles south-westward of its northern extremity.

Charts 2402, 2413.

Petong and adjacent channels.—Dangers.—Petong (Pitong) is a hilly island, attaining a height of 501 feet ($152^{m}7$) in the southern part, and lies with its southern extremity about 7 miles westward of the northern extremity of Abang besar. It is surrounded by a reef, which extends about 4 cables from its eastern point, and on which there are several above-water rocks. There are several islets, rocks and shoal patches outside the coastal reef. The outer of these are an islet about 9 cables east-south-eastward of its southern extremity; a drying rock

Charts 2402, 2413.

about 4 cables east-south-eastward of its eastern extremity; an islet about 8 cables south-south-westward of its northern extremity; an islet about 3 cables westward of its southern extremity; and a 1¾-fathom (3^{m}2) patch about 2 cables west-south-westward of its southern extremity. A bank, with a least depth of 3¼ fathoms (5^{m}9), lies off the north-eastern coast, with its shoalest part about 8 cables northward of the eastern extremity of the island; depths of less than 6 fathoms (11^{m}0) extend for about 1¾ miles northward and north-eastward from the same point.

The channel between Petong and Abang besar is deep in mid-channel, but the dangers on either side are not easily discerned. Cameleon rock, which dries, is in the southern approach to this channel and about 5½ miles south-south-eastward of the southern extremity of Petong; a shoal, with a least depth of 3¾ fathoms (6^{m}9), lies about half a mile northward of this rock. Hipomenes klip, nearly 1½ miles westward of Tortel, has a depth of 5 feet (1^{m}5) over it.

Anak Petong (Pitong) consists of two islets lying on a reef which dries, situated nearly 2½ miles westward of Petong; the north-eastern islet is 184 feet (56^{m}1) high. An above-water rock lies on the fringing reef about 2 cables south-westward of the south-western islet. Depths of less than 6 fathoms (11^{m}0) extend for about half a mile south-eastward from the north-eastern islet. The channel between Anak Petong and Petong is deep and is easy to navigate.

Gull rock, nearly 1½ miles west-north-westward of the south-western islet of Anak Petong, is 58 feet (17^{m}7) high. Some 5-fathom (9^{m}1) patches lie close north-eastward and about 2 miles south-westward of this rock.

Chart 2413.

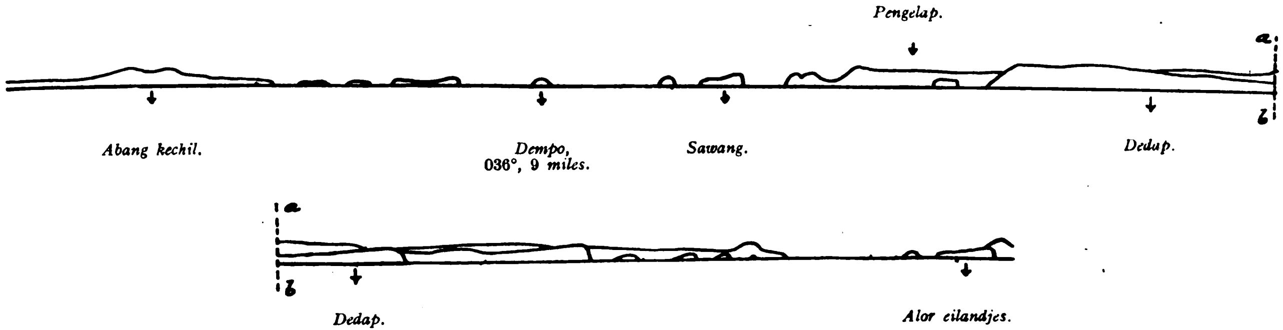
Straat Dempo.—Straat Dempo, between the Abang eilanden and Galang Baru, is deep and is easy to navigate. Dempo and Haai rif, lying on the northern side of the south-eastern entrance, have been described on page 200. The western side of Galang Baru is hilly, Tafelberg, 646 feet (196^{m}9) high, in the northern part, being a useful landmark; *see* views facing pages 200, 228.

There are several islets off the western side of Galang Baru, the principal being Ngual, which lies with its southern extremity about 3 miles east-north-eastward of the northern extremity of Abang besar; it is surrounded by a reef, which extends about 4 cables from its southern extremity. A rock, with a depth of 4 feet (1^{m}2) over it, lies about 6 cables south-westward of the northern extremity of Ngual (*Lat. 0° 39′ N., Long. 104° 14′ E.*) and there is a 6-fathom (11^{m}0) patch about one mile south-westward of the same point. Labun, an islet surrounded by a reef, is situated about 6 cables north-north-westward of the northern extremity of Ngual. The channel between Ngual and Galang Baru is obstructed by several islets and reefs and should not be attempted without local knowledge.

Western coast of Galang.—Islets.—Dangers.—The western entrance to Straat Penjabung (page 200) is situated about 3 miles north-north-westward of Labun; a rock, with a least depth of 3 feet (0^{m}9) over it, lies about three-quarters of a mile south-westward of the entrance to this strait and there are several other dangers between it and the entrance. The islet of Anak Mati is situated about 3¾ miles north-north-westward of Labun and 2 cables off the western coast of

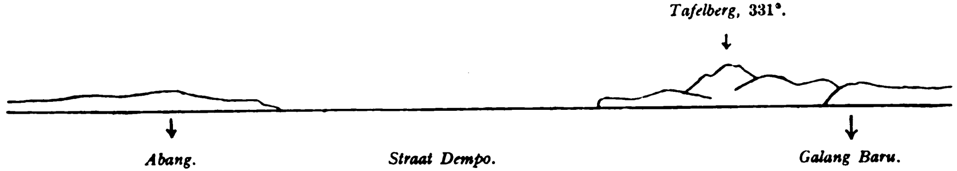
Charts 1789, 2757, 2660a, 941a, 1263.

To face page 228.



View, in 2 parts, of the south-western entrance to Straat Abang.

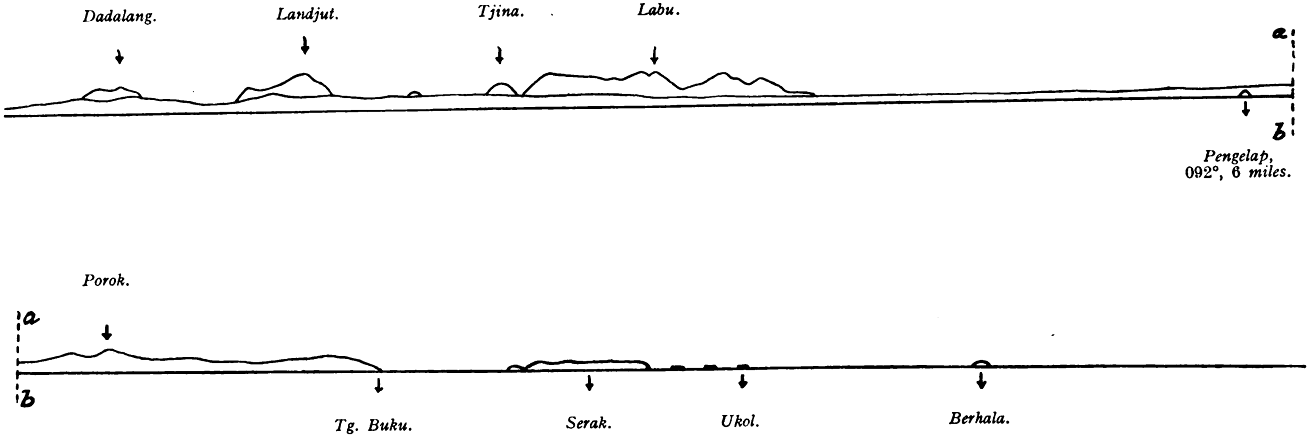
(*Original dated* 1913.)



South-eastern entrance to Straat Dempo, from the vicinity of Udiep.

(*Original dated* 1929.)

To face page 229.



View, in 2 parts, of the western coast of Singkep from 3 miles eastward of Speke rif.

(*Original dated* 1949.)

Chart 2413.

Galang; Melor eilandjes, two islets close together on a drying reef, lie about one mile north-north-westward of Anak Mati. Gong, a hill 587 feet ($178^{m}9$) high, is situated about one mile east-north-eastward of the Melor eilandjes.

The western entrance to Straat Tiung (page 202) is situated about 2½ miles northward of the Melor eilandjes; depths of less than 5 fathoms ($9^{m}1$) extend up to about 1½ miles west-south-westward of the southern entrance point to this strait, and a rock awash lies about one mile westward of the same point. For description of the western coast of Rempang and off-lying dangers, *see* page 268.

Charts 2413, 1789.

Tidal streams.—The diurnal tidal stream predominates in that portion of Riouw and Lingga archipels which lies northward of Lingga and southward of Straat Riouw, so that the stream only flows strongly once a day in each direction. In those passages which are available for large vessels the rate of the streams is generally not more than 2 or 2½ knots; in some of the narrow channels, which are, however, of little importance to navigation, this rate may increase to 3 or 4 knots. The Admiralty Tide and Tidal Stream Tables give daily predictions of the tidal streams in the north-eastern and eastern approaches to the Lingga Archipelago (*Lat. 0° 37′ N., Long. 104° 25′ E. and Lat. 0° 17′ S., Long. 105° 10′ E., respectively.*

The predictions give the time of maximum rate in either direction, the times at which the streams turn and the maximum rate in either direction. In the north-eastern approaches the streams set 060° and 240°, in the eastern approaches 022° and 202°.

In general the horizontal movement of the water is from the South China sea to the fairly open part between the Sumatra coast and Lingga archipel, or vice versa. The numerous channels through which the water must pass, some of which are almost at right angles to the main direction of the streams, cause considerable deviations from this general movement.

When the stream is running in a general westerly direction, from the South China sea to the open part westward of the archipelago, it runs through Straat Dempo, Straat Abang and Straat Pengelap in the direction of the axis of these straits; there is then a south-going stream between Pengelap and Dedap. This stream runs westward through Straat Merodong, and in a north-westerly direction along the eastern coast of Lingga, passing along both sides of Sebangka, with a strong inset between Kongka besar and Kentar, and especially so between the former island and Blading. It also runs north-westward through Straat Temiang, passing northward of Kebat and eastward of Batu Belajar (*Lat. 0° 25′ N., Long. 104° 16′ E.*). At this position there is thus a junction of the streams from Straat Temiang and Straat Merodong on the one side and Straat Pengelap on the other side; as the direction of these two streams are almost at right angles to each other, heavy tide-rips and whirlpools occur, and on one occasion a ridge or crest of water was observed. One part of the stream, which runs approximately in a north-north-westerly direction along the eastern coast of Sebangka, runs through the channel westward of Mesanak and unites with the west-going stream running through Straat Merodong.

The stream which at this time is running north-westward between Sebangka and Bakung curves westward off Batang and Saga, and then

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2413, 1789.

runs round Karoti, an islet lying off the north-western end of Bakung, in a south-westerly direction, and also southward and south-eastward through Straat Tjempah (page 237). The stream unites here with the streams running through Straat Abang and Straat Pengelap from the China sea, which pass westward of Batu Belajar (*Lat. 0° 25′ N., Long. 104° 16′ E.*) and then curve southward ; these united streams then run along Buaja and Tjempah, and the western sides of Bakung and Lingga, in a direction varying between south-east and south-south-east. Since there is at the same time a west-going stream in Straat Dasi, sometimes attaining a rate of from 4 to 5 knots, heavy whirlpools and tide-rips are frequently observed off the western entrance to this strait ; there is also at the same time a west-going stream in Straat Lima. If a vessel is 10 miles offshore when passing between Sumatra and Lingga, no stream will be noticeable at this time.

The times at which the streams flow get progressively later from north to south. It may be assumed that the times at which they flow through Straat Lima is about midway between those in the north-eastern approaches and Straat Berhala.

When the horizontal movement of the water changes its main direction, i.e., when it runs from the open sea between Sumatra and Lingga archipel to the South China sea, the stream runs in the opposite direction to that described in nearly all the straits and channels ; in places where two or more channels unite, however, there may be some discrepancy.

Charts 2757, 1355, 2660a, 941a, 1263.

CHAPTER IX

INNER ROUTE FROM STRAAT BANKA TO SINGAPORE STRAIT, BY STRAAT BERHALA AND STRAAT DURIAN.—EASTERN SIDE OF SUMATRA.—STRAAT SUGI, STRAAT SULIT AND STRAAT TJOMBOL

Chart 2757.

INNER ROUTE.—General remarks.—Straat Berhala forms the southern part of the inner route to Singapore, and Straat Durian the northern part; the intermediate part, between the western side of Lingga archipel and the eastern side of Sumatra, has no specific denomination. During the strength of the north-east monsoon this route can be taken with advantage by low-powered vessels, especially during the months of December, January, and February, when strong northerly winds prevail; there is then smooth water, good anchorage, and but little tidal stream.

The inner route is lighted and buoyed, and is available for all classes of vessels. The least depth in the fairway, from 5½ to 6 fathoms ($10^{m}1$ to $11^{m}0$), is in the southern part, south-westward of Mutji.

Chart 1789.

Straat Berhala.—Dangers.—Light.—Straat Berhala lies between Tanjong Djabung (page 110) and the Sumatra coast westward, on the southern side, and Berhala on the northern side.

Tanjong Djabung (Jabong) (*Lat. 1° 01′ S., Long. 104° 22′ E.*) must not be approached in a depth of less than 9 fathoms ($16^{m}5$), as the mud-bank, which extends about one mile from the point, is steep-to and sounding gives no warning; it is also possible that this point is extending. *See* page 110 for dangers eastward and south-eastward.

Berhala, nearly 10 miles north-north-eastward of Tanjong Djabung, is a rocky, hilly island, covered with high trees and is visible about 20 miles in clear weather; on the western side of the island is a hill with two bare peaks, 298 feet ($90^{m}8$) high. Except on the south-western side, the island is surrounded by a reef, which dries, extending about 2 cables north-eastward, and there are several above-water and sunken rocks for nearly one mile farther north-eastward; depths of less than 6 fathoms ($11^{m}0$) extend up to 1¾ miles eastward from its northern extremity. There are several rocks, covered with vegetation, off the southern side. Berhala must not be approached by vessels passing through the strait in a depth of less than 11 fathoms ($20^{m}1$). A shoal, with a depth of 3 fathoms ($5^{m}5$) over it, lies about 1¼ miles north-westward of Berhala, and there is a 3½-fathom ($6^{m}4$) patch about 7 cables southward of its southern extremity; a 5½-fathom ($10^{m}1$) patch lies nearly 6 miles south-south-eastward of Berhala.

There is fairly good anchorage fully half a mile off the western and

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

northern sides of Berhala, in depths of from 7 to 8 fathoms ($12^{m}8$ to $14^{m}6$), but if anchoring off the northern side care must be taken not to go too far eastward on account of the rocks there. There is a sandy beach on the northern coast, where landing can be effected at high water; landing can also be effected on a sandy beach on the western coast, but it is difficult to reach other parts of the island from here.

A light is exhibited, at an elevation of 84 feet ($25^{m}6$), from a white iron framework structure, 69 feet ($21^{m}0$) in height, situated on a rocky islet about 3 cables southward of Berhala (*Lat. 0° 52′ S., Long. 104° 24′ E.*).

Sikh shoal, with a depth of 2½ fathoms ($4^{m}6$) over it, lies about 14 miles north-westward of Berhala. A 4¼-fathom ($7^{m}8$) patch and a 4¾-fathom ($8^{m}7$) patch lie about one mile south-eastward and 1¼ miles south-south-westward, respectively, of this shoal.

Tidal streams.—The tidal streams in Straat Berhala are of a mixed character, but the semi-diurnal stream predominates; the directions are west-north-west and east-south-east.

The tidal streams in Berhala Strait (*Lat. 0° 52′ S., Long. 104° 22′ E.*) are predicted in Admiralty Tide and Tidal Stream Tables. The predictions give the time of maximum rate in either direction, the times at which the streams turn and the maximum rate in either direction.

The maximum rate of the stream setting in a west-north-west direction can be expected to average 1½ knots from October to January and from April to July, with semi-diurnal spring tides; the maximum rate in an east-south-east direction can be expected to average 2 knots in December and January, and in June and July, with semi-diurnal spring tides.

Dangers north-eastward of Berhala.—The channel between Berhala (*Lat. 0° 52′ S., Long. 104° 24′ E.*) and Singkep Laut (page 213) is not safe, as there are several rocks in it, and uncharted dangers may exist. Midden Vaarwaters klippen (Middle rocks), about 3½ miles north-eastward of Berhala, are always visible; a rock, with a depth of less than 6 feet ($1^{m}8$) over it, lies about 3 cables north-westward of the north-western rock. Pollux klippen are two rocks which are just covered at low water, and the western lies about 4½ miles north-eastward of Berhala; they never break, but at low water, in a calm sea, there are tide-rips over them. The depths around these dangers are irregular.

Western side of Singkep.—Islets.—Dangers.—The western coast of Singkep, between Tanjong Buku (page 213) and Tanjong Sebajur (Sebayur), about 14 miles north-north-westward, is low, except for the hills Buku, Porok and Mentigi, described on page 213. Sungei Marok discharges about 9 miles north-north-westward of Tanjong Buku, but its mouth dries. The whole of this coast is fringed by a reef, which extends as much as three-quarters of a mile in the southern part, and on which there are several above-water rocks and islets, including Tebakar, Burung and Anak Burung, about 2¼, 6, and 6¾ miles, respectively, north-north-westward of Tanjong Buku; there are several dangers outside this reef. Marok, an islet with several above-water rocks in its vicinity, is situated about one mile south-south-westward of the mouth of Sungei Marok and three-quarters of a mile offshore. James rif, with a depth of one foot ($0^{m}3$) over it,

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

lies about 3½ miles north-westward of Tanjong Buku and 1½ miles offshore, and Batu Djaja, consisting of three sunken rocks, lie about midway between James rif and the coast.

Serak is a low, wooded islet lying about 7 miles west-north-westward of Tanjong Buku ; it is surrounded by a reef, having numerous rocks on it, which extends fully one mile from its south-eastern side. A 1¼-fathom ($2^{m}3$) patch lies about 1½ miles south-eastward of Serak (*Lat. 0° 40′ S., Long. 104° 14′ E.*). *See* view facing page 229.

Ukol is a small islet about half a mile south-westward of Serak, and a rock, which dries, lies about 1¼ miles south-eastward of Ukol. Two rocks, which dry, lie about half a mile and one mile, respectively, northward of Serak, and there is a shoal, with a least depth of 3¼ fathoms ($5^{m}9$), about one mile north-westward of this islet.

Pengelap is a low, wooded islet lying about 2¾ miles north-north-eastward of Serak. A steep-to shoal, with depths of less than 3 fathoms ($5^{m}5$) and a rock which dries on it, extends about 2 miles north-westward and one mile south-eastward from Pengelap ; a shoal, with a least depth of 3¼ fathoms ($5^{m}9$), lies about 1½ miles westward of the islet. A narrow ridge, with a least depth of 4¼ fathoms ($7^{m}8$), lies about midway between Pengelap and the coast eastward ; a similar ridge, with depths of from 3¾ to 5 fathoms ($6^{m}9$ to $9^{m}1$) over it, extends about 4½ miles north-westward from a position about 2½ miles northward of Pengelap. A 5-fathom ($9^{m}1$) patch lies about 3½ miles north-westward of Pengelap.

A small coral reef, with a depth of 2 fathoms ($3^{m}7$) over it, lies about 7¼ miles westward of Tanjong Sebajur.

Outlying islets and dangers.—Lights.—Speke rif (*Lat. 0° 37′ S., Long. 104° 06′ E.*), nearly 9 miles westward of Pengelap, is a small reef which dries. A light is exhibited, at an elevation of 37 feet ($11^{m}3$), from a black iron light-beacon, 26 feet ($7^{m}9$) in height, situated on Speke rif.

A shoal, with a least depth of 3 fathoms ($5^{m}5$) over it, lies about 5 miles west-south-westward of Speke rif.

Mutji (Muchi), about 6 miles north-westward of Speke rif, is the southernmost of a group of three thickly wooded islets and some rocks covered with vegetation. Atkin rif, which is never marked by surf, lies about three-quarters of a mile south-eastward of Mutji and dries ; there is a coral shoal, with a depth of 2¾ fathoms ($5^{m}0$) over it, about one mile east-north-eastward of Mutji. Alang Tiga, 258 feet ($78^{m}6$) high, is the middle islet of the group, and Beralas, 226 feet ($68^{m}9$) high, is the northernmost islet. There are depths of from 5½ to 6 fathoms ($10^{m}1$ to $11^{m}0$) south-westward of Mutji, and this is the shoalest part of the inner route. Depths of less than 6 fathoms ($11^{m}0$) extend up to 3½ miles north-westward from Beralas, and a 5½-fathom ($10^{m}1$) patch lies about 4½ miles north-north-westward of the same islet.

A light is exhibited at an elevation of 216 feet ($65^{m}8$), from a white iron framework structure, 69 feet ($21^{m}0$) in height, situated on a hill on Mutji.

Tidal streams.—The tidal streams near Mutji have a maximum rate of about 2 knots either north-going or south-going. The precise direction of the stream varies widely among the Alang Tiga eilanden and with the prevailing wind.

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

Directions.—An area of the inner route, commencing eastward of Tanjong Djabung and ending about 14 miles northward of Beralas, was swept by vessels of the Netherlands Government in 1933-34; it may, therefore, be assumed that depths less than those shown on the latest charts will not be found. This area runs in a north-westerly direction through Straat Berhala and is fully 6 miles broad, the north-eastern limit passing about half a mile southward of Berhala light-structure. Sikh shoal lies approximately on the axis of this area, which has been swept for about 4 miles on either side of this shoal. The swept area then runs in a north-north-westerly direction, the eastern limit passing nearly 2 miles westward of Serak (*Lat. 0° 40′ S., Long. 104° 14′ E.*) and 4 miles eastward of Speke rif, whilst the western limit is about 7 miles westward of this rock. Near Mutji the swept area takes a northerly direction and is about 10 miles broad, with the Alang Tiga eilanden lying in the middle of it; an area around these islets, about 6 miles long in a north and south direction, and for about one mile eastward and westward of Alang Tiga, has not been swept.

The track recommended for vessels is as follows: from a position about one mile southward of Berhala light-structure a course of 309° should be steered to pass nearly 3 miles north-eastward of Sikh shoal, thence about 1¾ miles south-westward of Speke rif, and 3 miles south-westward of Mutji light-structure. Vessels can also pass eastward of Speke rif and the Alang Tiga eilanden, but in this case care must be taken to pass not more than about 4 miles eastward of Beralas, on account of the coral reef, with a depth of 2 fathoms ($3^{m}7$), which lies about 5 miles eastward of that islet. Mariners should bear in mind the possibility of being set north-eastward by the ebb stream from the mouths of Kuala Djambi (Jambie river), *see* page 238.

At night it is always preferable to pass westward of the Alang Tiga eilanden, as Mutji light is obscured in the eastern passage between the bearings 284° and 192°.

The Directions for vessels proceeding northward through Straat Durian are continued on page 262.

Islands off the north-western extremity of Singkep.—The Posik eilanden lie off the north-western extremity of Singkep and are separated from it by Straat Sebajur; they are all thickly wooded and hilly. The principal islands of the group are Bandahara, Posik, Rusuk Buaja, Pandjang (Panjang) and Nodja (Noja); Rusuk Buaja and Bandahara are easy to identify. These islands are sparsely populated; Posik, the principal village, is situated on the northern coast of Posik, and there is a village on the southern extremity of Pandjang, where praus are built. All the islands are surrounded by coastal reefs on which there are several above-water rocks and islets. Nibung is an islet lying on the coastal reef which extends nearly 2 miles northward from Posik. There are several passages, navigable for praus, between the islands; the principal of these is Selat Membatjang (Membachang), between Bandahara and Posik. There is much prau traffic in the vicinity of these islands, both by day and by night. *See* view facing page 227.

A 5½-fathom ($10^{m}1$) patch lies about 3 miles south-westward of the south-western extremity of Bandahara, and a 3-fathom ($5^{m}5$) shoal extends about one mile north-north-westward from a position about 3 miles north-westward of the same point.

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

A shoal, with a least depth of 4 fathoms ($7^{m}3$) over it, lies about 1¼ miles north-westward of Rusuk Buaja and nearly in the middle of the passage between this island and Silenseng.

Silenseng (*Lat. 0° 18′ S., Long. 104° 07′ E.*), about 2½ miles north-westward of Rusuk Buaja, is an islet surrounded by a reef which dries, extending about 3 cables from its western side; there is a small islet on the reef which extends from the northern side. A detached rock, which dries, lies about 3 cables eastward of the southern point of Silenseng, and a 5-fathom ($9^{m}1$) patch lies about half a mile eastward of its northern point; a 5½-fathom ($10^{m}1$) patch lies about 3 miles east-north-eastward of the islet.

Buntar, about 2 miles northward of Silenseng, is a rock covered with vegetation.

Straat Sebajur.—Dangers.—Straat Sebajur (Sebayur) should not be attempted without local knowledge, as there are several shoals and reefs in it. A bank, with a depth of 1¼ fathoms ($2^{m}3$) on its southern end, extends nearly 4 miles southward from Bandahara, and forms the western side of the southern part of the strait. A narrow, steep-to sandbank, which dries in places, runs parallel to the Singkep coast between Tanjong Sebajur and Tanjong Irat, about 5½ miles north-north-eastward, and divides the channel into two parts. Bang, a rock which dries, lies on the northern extremity of this sandbank and about three-quarters of a mile west-south-westward of Tanjong Irat. The channel eastward of this sandbank is straight and is fairly easy to navigate, but in the southern entrance, off Tanjong Sebajur, there is a bar with a depth of about 2¾ fathoms ($5^{m}0$). Rapang, a prominent islet with a sharp, wooded hill on it, lies on the western side of the northern entrance and nearly one mile north-westward of Tanjong Irat.

Depths of less than 3 fathoms ($5^{m}5$) and some drying reefs extend about 1½ miles south-westward from Rapang. Besi, an islet surrounded by a reef, on the northern end of which is another islet, is situated 1½ miles northward of Tanjong Irat. Two 3-fathom ($5^{m}5$) patches lie about 1½ miles east-south-eastward and three-quarters of a mile north-eastward of Besi, and there is a 5-fathom ($9^{m}1$) patch nearly 1½ miles north-eastward of the same islet. Penganak Nodja, an islet, lies on the northern extremity of the reef fringing Nodja (page 234); there is a rock awash about 2 cables northward of Penganak Nodja.

Sungei Tjukas discharges into the strait nearly 2 miles southward of Tanjong Irat, but the bar off the entrance nearly dries, although there are depths of from 5 feet ($1^{m}5$) to 3¾ fathoms ($6^{m}9$) inside as far as the village of Tjukas (Chukas), which is situated on the southern side of the mouth. Tjukas is an islet on the coastal reef which extends nearly half a mile from the northern entrance point and dries.

Western sides of Lingga and Bakung.—The principal landmarks for navigation in this part of the inner route are Gunung Daik (Lingga peak) and Sepintjan (Sepinchan), which have been described on page **217**. Tanjong Labuan Dadong, the south-western extremity of Lingga (*see* also page **216**), and Tanjong Datok, about 2¼ miles northward, are very prominent; there is a rock or islet on the coastal reef which extends from each of these points. Labuan Dadong, an islet about 1¼ miles south-eastward of the former point, is described on page **216**. A bank of hard sand, with depths of from 2½ to 4 fathoms

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

($4^{m}6$ to $7^{m}3$) over it, lies off the coast between these two points, the outer edge lying nearly 4 miles offshore; there is a narrow passage, with depths of over 5½ fathoms ($10^{m}1$), between this bank and the coast.

A 5¾-fathom ($10^{m}5$) patch lies about 5¼ miles west-south-westward of Tanjong Datok (*Lat. 0° 11′ S. Long. 104° 25′ E.*). Pulon is a prominent islet, with a sharp summit, lying on the coastal reef about 2 miles north-eastward of Tanjong Datok.

A hill, 462 feet ($140^{m}8$) high, is situated on the coast about 3¼ miles southward of the north-western extremity of Lingga, and two peaks, the western of which is 725 feet ($221^{m}0$) high, lie about 6 miles south-south-eastward of the same point.

A 3¼-fathom ($5^{m}9$) patch lies nearly 4 miles south-westward of the north-western point of Lingga and about 2½ miles offshore; there are shoal patches, with depths of 4¼ and 5½ fathoms ($7^{m}8$ and $10^{m}1$), 6 cables eastward and north-westward, respectively, of this patch, and a 5-fathom ($9^{m}1$) patch lies nearly 3½ miles west-south-westward of the north-western point of Lingga. For other dangers off the western entrance to Straat Dasi, *see* page 221.

The western side of Bakung is fairly steep and rocky in places; a hill, 308 feet ($93^{m}9$) high, is situated on the coast about 4½ miles north-westward of its southern extremity.

Islands and dangers westward of Bakung.—A group of islands, the principal of which are Buaja (Buaya) and Tjempah (Chempa), lies westward of the northern part of Bakung. Buaja, the outer of the two, lies about 5¾ miles south-westward of Ompok (page 223) and about 6 miles westward of the northern extremity of Bakung, and has the shape of an alligator when seen from northward; its summit, 747 feet ($227^{m}7$) high, is situated in the south-eastern part and is visible from a distance of over 30 miles in clear weather. The island is surrounded by a narrow reef, and two detached shoals, with depths of 1½ and 2¾ fathoms ($2^{m}7$ and $5^{m}0$) over them, lie, respectively, about half a mile and one mile westward of its northern extremity. A 5½-fathom ($10^{m}1$) patch lies about 1½ miles eastward of the northern extremity of Buaja. Si Keling (*Lat. 0° 08′ N., Long. 104° 14′ E.*) is an island, 295 feet ($89^{m}9$) high, lying about one mile southward of the southern point of Buaja, and there is a rock, which dries, in the passage between. A 4¼-fathom ($7^{m}8$) patch lies about 7 cables west-north-westward of the western extremity of Si Keling. Blanding, Tuka, and Lobam are three islands joined together by a reef, which is separated from the western side of Buaja by a deep passage fully half a mile broad; Lobam is 272 feet ($82^{m}9$) high. Leda, a rock awash, lies fully one mile north-westward of the northern extremity of Lobam, and between them is a reef which dries; there are often heavy tide-rips in this vicinity.

Tjempah, with its northern extremity about 2¾ miles eastward of Buaja, is steep on its eastern and southern sides; the summit of the island, 377 feet ($114^{m}9$) high, is situated in the northern part.

A detached reef, with a depth of less than 2 feet ($0^{m}6$) over it, lies off the south-western side of Tjempah, about 2 miles southward of its summit; the northern end of the reef, which may be of considerable size, lies about a quarter of a mile offshore and the reef extends in a southerly direction for about half a cable. There is a one-fathom ($1^{m}8$) patch nearly half a mile west-north-westward of this reef.

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Chart 1789.

A 2¾-fathom ($5^{m}0$) patch lies about 1¾ miles south-westward of the summit of Tjempah, and depths of less than 5 fathoms ($9^{m}1$) extend about 1¾ miles north-westward and southward from this patch.

Several islands and islets lie between Tjempah and Buaja, the principal being Gentung, Laut, Budjang, Setambal, and Bulat. There is a deep channel, about 3 cables wide at its narrowest part, between Buaja and Setambal.

Straat Tjempah.—Straat Tjempah (Chempa), between Tjempah and Bakung, is frequently used by small power vessels and praus proceeding to and from Lingga. The Tjempah side is held, as this side of the strait is deep and entirely clear. On the eastern side of the northern entrance is a large bank, with a least depth of 3 feet ($0^{m}9$) on its northern end; the southern end of this bank lies fully 2 miles eastward of the northern extremity of Tjempah. The islands of Karoti (*Lat. 0° 13′ N., Long. 104° 19′ E.*) and Blandoh (Blando) besar lie on the north-eastern side of the strait about 2¾ miles north-north-eastward and 2½ miles east-north-eastward, respectively, of the northern extremity of Tjempah. *See* view facing page 250.

EASTERN SIDE OF SUMATRA.—The portion of the eastern coast of Sumatra which forms the western side of the inner route from Straat Berhala to Straat Durian is low, uniformly wooded, and devoid of conspicuous landmarks. Several rivers discharge in the southern part of this coast between Tanjong Djabung (Jabong) and Tanjong Dato, about 70 miles north-north-westward, the principal being Kuala Djambi (Jambie river), Sungei Tungkal (Tongkal), Sungei Reteh, and Sungei Indragiri. A mudbank extends from this coast, and between the mouths of Kuala Djambi and Sungei Reteh there are depths of less than 5 fathoms ($9^{m}1$) for as much as 16 miles offshore.

Tidal streams.—The main direction of the tidal streams between Straat Berhala and Straat Durian is northward and southward. Between Amphitrite baai and Straat Lima the stream may attain a rate of 2 knots, and off Tanjong Dato a maximum rate of 3 knots may occur.

Charts 1789, 2757.

KUALA DJAMBI.—The Kuala Djambi (Jambie river), named Batang Hari above the delta, is the largest river in Sumatra; it rises in the Barisan gebergte, flows through the Padang highlands, Batang Hari and Djambi territories, and, after taking in several tributaries, discharges in a delta westward of Tanjong Djabung (*Lat. 1° 01′ S., Long. 104° 22′ E.*). The only arms of the delta which are of any importance to shipping are Kuala Berbak and Kuala Niur; the remainder are only navigable by small craft with local knowledge. Kuala Niur, which is buoyed, enters the sea about 32 miles westward of Tanjong Djabung, and is the usual route taken by vessels proceeding to Djambi, the capital of the district, situated about 85 miles up the river. Vessels of up to 150 feet ($45^{m}7$) in length can negotiate the bends in the river without difficulty, and it is reported that vessels of up to 200 feet ($61^{m}0$) could, with due care, be brought up the river as far as Djambi, provided their draught permitted. Kuala Berbak, which flows out about 10 miles westward of Tanjong Djabung, is only available for vessels of light draught with local knowledge; it is difficult to enter on account of the banks, many of which dry, and islands off

Charts 2757, 2660a, 941a, 1263.

the entrance, and farther up there are some very difficult bends in the channel. In the upper reaches of the river, following rainy periods, the flood water may run at great speed for a day or two, and may be a source of danger to vessels on account of large trees and other debris being borne with it.

The whole of the delta of Kuala Djambi, being low and uniformly wooded, affords no landmarks, and vessels must bear in mind that the mud coastal bank may be extending.

Tidal streams and currents.—The tidal streams are predominantly semi-diurnal. About 1½ miles northward of Beting Laut the stream sets westward on the rising tide and eastward on the falling tide; maximum rate 1½ knots in either direction. When the banks, which dry, lying off the mouth of Kuala Niur are covered, the in-going stream will be setting south-westward across the channel, and the out-going stream will be setting north-eastward; the average rate is 2½ knots.

Nothing can be predicted with certainty concerning the stream in the upper part of Kuala Niur and the portion of the Kuala Djambi and Batang Hari below Muara Kumpeh; at this village the stream is dependent on the conditions of the river farther upstream. At Djambi the maximum rate is 2½ knots, which is somewhat decreased at low water levels by tidal movement. When the river is in flood a rate of 4 knots may be reached. Above Djambi there is no in-going stream, the flow is continuously downstream.

Depths.—The depths in Kuala Djambi and Batang Hari at mean lowest water were as follows:—

Outer bar of Kuala Niur, nearly 4 miles north-north-eastward of Tanjong Solok, the western entrance point of the river: 3 feet ($0^{m}9$), in 1952.

Inner bar of Kuala Niur, off the mouth of Sungei Kelemak, situated about 29 miles above Tanjong Solok: 7 feet ($2^{m}1$), in 1952; a small patch, with a least depth of 9 feet ($2^{m}7$) over it, lies in mid-channel about 4 cables westward of Kota Kandis, situated about 6 miles below the mouth of Sungei Kelemak.

Bar off Kampong Baru, situated on the left bank about one mile below Djambi: 8 feet ($2^{m}4$), in 1952.

Elsewhere a least depth of 10 feet ($3^{m}0$) could be reckoned on, in 1952, as far as Djambi. In order to pass Sungei Kelemak and the bar at Kampong Baru in safety the draught of a vessel should not exceed 12 feet ($3^{m}7$); in the dry season it may happen that there are depths of not more than 9 feet ($2^{m}7$) at high water on the bar at Kampong Baru (*Lat. 1° 34′ S., Long. 103° 38′ E.*).

The highest water levels, which sometimes reach 23 feet ($7^{m}0$) above mean lowest water, occur from December to April, although there may be also very low water levels during that period. The lowest levels in the upper reaches are to be expected from June to September.

Above the delta the tidal influence decreases rapidly, and is only noticeable in the tract between Muara Kumpeh, about 43 miles above Tanjong Solok, and Djambi in the periods of low water level. The rise in the water level on the bar off Kampong Baru above mean lowest level is then mainly due to the level of the river in the upper reaches.

At high water, which occurs at Kampong Baru about 7 hours later

Charts 1789, 2757.

than in the mouth of Kuala Niur, the depth may be nearly one foot ($0^{m}3$) more. In very exceptional circumstances it may happen that the depth on the bar off Kampong Baru falls to 2 feet ($0^{m}6$) below the mean lowest level.

On an average, the times of high and low water fall one hour later for every 12 miles up-stream, so that high and low water on the inner bar, off Sungei Kelemak, occur about 2½ hours later than on the outer bar.

Tide gauges.—A tide gauge, divided into feet, is situated at the upstream end of Kampong Tandjung Solok, on the western bank of Kuala Niur and about 1½ miles southward of Tanjong Solok (*Lat. 1° 00′ S., Long. 103° 49′ E.*); the gauge gives the depth in the shoalest part of the channel over the outer bar.

A tide gauge, divided into feet, stands on the right bank about three-quarters of a mile below Sungei Kelemak and a similar gauge stands on the left bank about half a mile above the same river; both these gauges give the depth on the bar near Sungei Kelemak.

A tide gauge, divided into feet, stands at Kampong Dohor, on the left bank about 3¾ cables below the crossing mark at Kampong Baru; the reading on this gauge, decreased by 4 inches ($0^{m}1$), gives the depth on the bar at Kampong Baru.

At Djambi there is a tide gauge on the concrete pier divided into centimetres. The zero of this gauge corresponds to the chart datum. The depth in centimetres over the shoalest part of the bar at Kampong Baru can be obtained by adding 260 to the tide gauge reading. Owing to silting of the bank the gauge can no longer be read below 138 centimetres.

Jetties.—Light.—At Kampong Tandjung Solok there is a light wooden jetty running the length of the village; in 1946, a depth of 5 fathoms ($9^{m}1$) was stated to exist off the village.

At Muara Sabak, on the eastern bank about 8 miles above Tanjong Solok, a wooden pier, about 8 feet ($2^{m}4$) wide, projects into the river for a distance of about 300 feet ($91^{m}4$); in 1946 the depth alongside was reported to be 4 fathoms ($7^{m}3$).

A light is exhibited, at an elevation of 11 feet ($3^{m}4$), from a wooden pile structure, 8 feet ($2^{m}4$) high, on this pier.

Pilotage.—Pilotage is compulsory for vessels of over 225 cubic metres capacity between Muara Sabak and Djambi; pilots can be obtained at Muara Sabak and Djambi. Incoming vessels should request the services of a pilot at least 24 hours before their expected time of arrival at Muara Sabak either by letter or by telegraph to the Harbour Master at Djambi. Outgoing vessels should request a pilot at least 6 hours before departure, and if departure is between 0200 and noon the request should be made before 2000 the previous day.

Chart 1789.

Entrance to Kuala Niur.—Buoyage.—Beacons.—The entrance to Kuala Niur, between Tanjong Solok and Tanjong Bensuang, about 1½ miles east-south-eastward, is fronted by a bank which dries over three large areas. Beting Sumbon, the western of these, extends about 3 miles northward from Tanjong Solok; Beting Laut and Beting Tengah, the other two, lie off the eastern side of Beting Sumbon, the former extending from 2 to 4½ miles northward of Tanjong Solok, and the latter from about 1¾ miles south-south-eastward to 4 miles north-eastward of the same point.

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Chart 1789.

A light-buoy, known as the Outer buoy, painted red and black in horizontal bands and exhibiting a *white flashing* light showing *one* flash of *five seconds* duration *every twelve seconds,* marks the entrance to the channel over the bar between Beting Laut and Beting Tengah, about 6 miles north-eastward of Tanjong Solok.

The north-western side of the bar channel is marked by a white can buoy, fitted with a reflector, moored about 2¼ miles north-north-eastward of Tanjong Solok.

A light-buoy, painted black and exhibiting a *red flashing* light showing a *short* flash *every five seconds,* marks the south-eastern side of the bar channel about 3¾ miles north-eastward of Tanjong Solok.

A light-buoy, painted white and exhibiting a *white flashing* light showing a *short* flash *every five seconds,* marks the western side of the channel about one mile northward of Tanjong Solok.

A beacon, surmounted by a rectangle and fitted with reflectors, stands on Tanjong Solok.

A beacon, surmounted by a white ball, stands about 3½ miles northward of Tanjong Solok and marks the western side of Beting Laut; a beacon, surmounted by a black ball, stands on the northern extremity of Beting Laut about 4 miles northward of Tanjong Solok (*Lat. 1° 00′ S., Long. 103° 49′ E.*).

A beacon, surmounted by a ball painted black and white in horizontal bands, stands on the south-eastern side of Beting Laut and about 2¼ miles north-north-eastward of Tanjong Solok. A similar beacon stands about 5 cables westward of the northern extremity of Beting Tangah.

A beacon marks the eastern side of Beting Sumbon about 1¼ miles north-north-westward of Tanjong Solok.

Muara Sabak.—The limits of the roadstead at Muara Sabak are a line drawn 270° from the beacon about 2½ cables north-eastward of the Harbour Master's flagstaff, and a line drawn about 247° from a similar beacon about 2½ cables south-westward of the same flagstaff.

Vessels must stop at Muara Sabak to embark a pilot and the ship's papers must be brought ashore for stamping, whilst a Custom's officer will come on board to examine the cargo during the passage to Djambi. There is a motor-boat available for communication with the shore.

Muara Sabak (*Lat. 1° 07′ S., Long 103° 51′ E.*) is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij. The Harbour Master is also the Custom's officer. There is no telephone communication with Djambi.

Directions.—Lights.—Beacons.—To enter Kuala Niur a vessel should steer for the Outer light-buoy, painted red and black, and thence she should steer about 234° to pass close north-westward of the light-buoy, painted black, moored about 3¾ miles north-eastward of Tanjong Solok; thence she should steer about 222° for the light-buoy moored about one mile northward of Tanjong Solok, passing south-eastward of the white can buoy about 2¼ miles north-north-eastward of the same point; when about 2¾ cables from the last-mentioned light-buoy she should steer more southward to pass not less than three-quarters of a cable eastward of it and, when past it, she should steer to bring it astern, bearing about 354°, and keep it so, which leads into the river. In 1952, the least depth on this track over the bar was 3 feet (0^{m}9).

Charts 2757, 941a, 1263.

Chart 2757.

The navigation of Kuala Niur and Batang Hari as far as Muara Kumpeh affords little difficulty to a vessel with a draught of from 10 to 13 feet ($3^{m}0$ to $4^{m}0$). Crossing over beacons stand on the left bank near Sungei Lambur, about 7 miles above Muara Sabak, and about 4 miles westward of Kota Kandis, a village about 7 miles farther up. Off the mouth of Sungei Kelemak a bank extends from the northern side of the river, leaving a channel barely 90 feet ($27^{m}4$) wide under the southern bank, which is marked by two white boards; whilst passing along the reach extending between these two boards the vessel must proceed at slow speed. A beacon, with rectangular topmark, stands on the right bank nearly 1½ miles north-north-eastward of the mouth of Sungei Kelemak. There is a crossing over beacon, with rectangular topmark, from which a *red fixed* light is exhibited at night, at Simpang Tua (*Lat. 1° 18′ S., Long. 104° 04′ E.*), a village on the eastern bank about 35 miles above the entrance to Kuala Nuir, at its junction with Kuala Berbak; a bank projects from the left bank here and the right bank must be held until abreast the beacon, when course should be altered sharply to 216°.

At Muara Kumpeh the right bank should be held as far as the junction of Sungei Muara Kumpeh and the Batang Hari when a mid-channel course should be resumed. At Tanjong Ulak Badar, a point on the southern bank about 1¼ miles above Muara Kumpeh, there is a sharp bend in the river, and as there is a very strong eddy off this point, with heavy whirlpools at the division of the main stream and eddy, some difficulty may be experienced here.

Kampong Manis Mata, a village, lies on the north-western bank about 11 miles above Tanjong Ulak Badar. Some coconut palms stand near the mouth of the small tributary Teluk Rembahan, which discharges about 4 cables above Kampong Manis Mata. From the mouth of Teluk Rembahan the vessel should cross over to the left bank with a course of 247°. This bank should be held at an ample distance as far as the two prominent round-topped trees about one mile above Kampong Manis Mata (*Lat. 1° 23′ S., Long. 103° 50′ E.*). Thence the vessel should cross over to the right bank with a south-westerly course and follow this bank at an ample distance. When the next bend in the left bank comes open the vessel should cross over to the left bank with a course of 283° and thence steer 240° for the two prominent round-topped trees standing close together in the middle of Kampong Rukam, a village on the southern bank about 4 miles above Kampong Manis Mata. The middle of the channel should now be followed until abreast Kampong Rukam when the left bank should be held.

About 2 miles above Kampong Rukam there is a slight bend in the river, and immediately above this bend the channel runs along the right bank; vessels should, however, keep fully 90 feet ($27^{m}4$) out from this bank, as there is an exceptionally large number of submerged tree trunks here. The same applies to the portion of the river between Kampong Sekombong, about 5 miles above Kampong Rukam, and Kampong Bungin, about 2 miles farther up, when the left bank is held. Between Kampong Bungin and Djambi the edges of the banks are marked by narrow strips of green grass at points where either the one-fathom ($1^{m}8$) line extends some distance from the river banks or where there are drying patches.

Just before reaching Keminking Luar, a village on the northern

Charts 941a, 1263.

Chart 2757.

bank about 9 miles above Kampong Rukam, the vessel should cross over to the right bank; this bank should be held at a short distance until the mosque at Kampong Muara Djambi, about one mile farther upstream, is abeam, when the vessel should cross over to the left bank.

Northward of the eastern point of the island of Sidjindjang, about 2½ miles below Djambi, the left bank must be held at an ample distance as a dangerous submerged tree trunk lies about 100 feet (30^m5) from the bank. Two crossing over beacons, with triangular topmarks, from which *red fixed* lights are exhibited at night, are situated on the left bank at Kampong Baru, and in line, bearing 007°–187°, lead in the deepest channel over the bar. A crossing over beacon, from which a *red fixed* light is exhibited at night, stands on the right bank about half a mile above Kampong Baru (*Lat. 1° 34′ S., Long. 103° 38′ E.*). On the left bank and just above Kampong Baru, there is another beacon which is the old crossing over mark.

Rede Djambi.—Piers and wharves.—Beacon.—Harbour facilities.—The limits of the roadstead off Djambi are the meridian through the western entrance point of Muara Kumpeh, about 3 miles below Djambi, and the meridian through the western entrance point of Sungei Teluk Mudung, about one mile above Djambi.

A floating pontoon jetty, strongly constructed and about 300 feet (91^m4) in length, is situated on the southern bank at Djambi; there is always sufficient water alongside and, in 1946, the depth alongside was reported to be 30 feet (9^m1). It is the main landing place and is also used for loading and unloading light goods; the Customs house and a warehouse lie behind it.

Just below the floating pontoon jetty, on the same bank, there is a concrete pier, 236 feet (71^m9) long; it is fitted with 3 cranes, but in 1952, these were unserviceable. This pier is the assigned place for embarking cargo; in the wet season this can be accomplished without difficulty, but in the dry season the head of the pier dries out and vessels must berth at pontoons laid along the pier, which entails the cargo being embarked by man-power.

Two oil wharves, situated on the south-eastern bank about half a mile and three-quarters of a mile downstream from Djambi, front the establishments of two oil companies. The north-eastern and larger wharf, which is about 130 feet (39^m6) long, had a depth of 30 feet (9^m1) alongside in 1952; there is a travelling crane of between 5 and 9 tons capacity on this wharf. The smaller wharf, which is 40 feet (12^m2) long, had a depth of 20 feet (6^m1) alongside in 1952. Vessels berthing at either of these wharves must secure to trees, and the use of an anchor is recommended.

A beacon, with rectangular topmark, stands on the northern bank at Tengah, about half a mile above Djambi (*Lat. 1° 35′ S., Long. 103° 37′ E.*).

Djambi is the headquarters of a Government official and a Harbour Master. It is connected to the general telegraphic system and there is telephonic communication with the upper reaches of the river. Djambi is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij and of some Chinese companies trading from Singapore. Stern-wheelers and motor-boats maintain a service with both upstream and downstream villages and coasting vessels ply frequently to and from Kampong Kuala Tungkal (page 243).

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Chart 2757.

Water can be obtained from pipes laid on to the piers, but it must not be used for drinking. There is a harbour doctor, also a hospital where infectious cases can be accepted.

The river above Djambi.—The portion of the river between Djambi and Kubu Kandang, a distance of about 42 miles, was surveyed in 1910, and is easy to navigate as far as Selat and Betung, two islands under the right bank about 30 miles above Djambi. Off the southern extremity of Betung there is a bar of hard sand, with a depth of 5 feet (1^m5) at mean lowest level, and 3 feet (0^m9) at exceptionally low level; the difference in the water level between the dry season, from June to September, and the wet season, from December to April, is nearly 3 feet (0^m9). On Kuab bar, about a mile below Kubu Kandang, there is a depth of only 1½ feet (0^m5) in the dry season.

The river between Kubu Kandang and Muara Tebo, about 150 miles above Djambi, is only navigable for small craft with a draught not exceeding 4 feet (1^m2), and local knowledge is essential. The breadth of the river varies between a half and 2 cables. At high water a stern-wheeler, with a draught of 4 feet (1^m2) can reach Kampong Teluk Kaju Putih, about 80 miles above Muara Tebo.

Principal tributaries.—Batang Tembesi, a right-hand tributary, enters the Batang Hari at Muara Tembesi, about 70 miles above Djambi (*Lat. 1° 35′ S., Long. 103° 37′ E.*). Motor vessels with a draught of 7 feet (2^m1) can reach Sarolangun village, about 70 miles above Muara Tembesi, at high water level, and those with a draught of 3 feet (0^m9) can reach Kampong Pauh, about 64 miles above Muara Tembesi, under all conditions.

Batang Tabir, a right-hand tributary, enters the Batang Hari opposite Panindjun village, which is situated on the left bank about 110 miles above Djambi. This tributary is only navigable for pulling boats as far as Telok Gedang, about 30 miles up.

Batang Tebo, also a right-hand tributary, enters the Batang Hari at Muara Tebo, about 150 miles above Djambi; it is navigable, at high water level, for stern-wheelers with a draught of 3 feet (0^m9) as far as Kampong Muara Bunga, about 40 miles above Muara Tebo.

Chart 1789.

COAST.—Sungei Tungkal.—Light.—Beacons.—Tanjong Tungkal (Tungka) Labu is a steeply sloping point, wooded with high trees, situated about 20 miles west-north-westward of Tanjong Solok, and the entrance to Sungei Tungkal (Tongkal) lies between this point and Tanjong Labu, a low light-green point, about 4½ miles north-westward. Several unimportant streams discharge along the coast between Tanjong Solok and Tanjong Tungkal Labu, the largest being Sungei Mandahara and Sungei Betara, about 9 and 17½ miles west-north-westward, respectively, of Tanjong Solok. The Malay village, Kampong Kuala Tungkal, is situated on the southern bank of Sungei Tungkal and about 2 miles within the entrance. The depths in the river are from 2¾ to 7½ fathoms (5^m0 to 13^m7) as far as Rumahan village, about 30 miles from the mouth; Sungei Rumahan enters Sungei Tungkal here, and the latter is still fully half a cable wide. Thence to Tebing Tinggi village, about 9 miles farther up, there are depths of from 2¾ to 6 fathoms (5^m0 to 11^m0), but the breadth decreases. Above this village the river is still deep for a considerable distance, but it becomes very narrow, and navigation is difficult owing to the sharp bends and trees standing in the water. The banks of the river are low and uniformly covered with nipa palm and sparsely populated; in the upper reaches the land becomes hilly. In the dry season the water is brackish for a considerable distance upstream.

There is no regular channel for crossing the coastal bank off the mouth of the river; the depths decrease gradually to about 3½ feet (1^{m}1) off the entrance. To enter the river the mouth should be brought well open on a bearing of 240° and the point on the eastern bank, about 2 miles within the entrance, should be steered for on this bearing; the huts of Kampong Kuala Tungkal (*Lat. 0° 49′ S., Long. 103° 27′ E.*) will then be seen nearly right ahead. The vessel should continue on this course until Tanjong Tungkal Labu bears about 147° when the eastern bank should be gradually closed and held until abreast Kampong Kuala Tungkal. There is good anchorage, in a depth of about 2½ fathoms (4^{m}6), about 1½ cables off the village.

A light is exhibited from a white iron column on the north-eastern pier at Kampong Kuala Tungkal.

The limits of the roadstead are a line drawn 337° from a beacon situated about 2¾ cables below the Custom house at Kampong Kuala Tungkal, and a line drawn 337° from a beacon about 2¾ cables above the Custom house.

Sungei Reteh.—The Sungei Reteh discharges through a delta mouth immediately northward of Tanjong Labu. The four arms of the delta are the Kuala Terap, Kuala Tengah, Kuala Udjan (Ujan) and Kuala Patah Parang; they are separated from each other by the islands Ruku, Kidjang (Kijang) and Putjuh (Puchuh), which are uniformly wooded like all this part of the Sumatra coast. The delta arms are difficult to enter without local knowledge; Tanjong Labu and Tanjong Tungkal Labu (page 243), the two entrance points of Sungei Tungkal, are fairly prominent when seen from abreast the mouths of the delta. Kuala Udjan can be approached by sounding, steering for the fairly prominent southern entrance point, bearing 270°; at high water a depth of about 2½ fathoms (4^{m}6) can be expected in the entrance, which almost dries, and within the river the depths are somewhat more. There is good holding ground in the mouth of the Kuala Udjan.

Kampong Kidjang is situated on the southern bank of Sungei Reteh just above the delta and about 10½ miles westward of the eastern extremity of Ruku; the holding ground off this village is bad. The river is navigable for vessels with a draught of 10 feet (3^{m}0) as far as Kampong Kota Baru, about 35 miles from the mouth; for about 6 miles above Kampong Kidjang (*Lat. 0° 43′ S., Long. 103° 12′ E.*) the river is shallow, but the bottom is very soft mud. There is anchorage, in a depth of 2¾ fathoms (5^{m}0), off Kampong Kota Baru, but hawsers should be taken to the shore, as the holding ground is bad.

Kampong Kota Baru, which is the headquarters of a district chief, is situated at the junction of the Sungei Gangsal and Sungei Reteh; the latter, flowing northward here, turns eastward to the sea. It is not navigable above this point. Sungei Gangsal trends westward and is navigable for a distance of about 10 miles, to its junction with Sungei Akar, by small vessels with a draught of 8 feet (2^{m}4) and a length of about 100 feet (30^{m}5).

Charts 2757, 941a, 1263.

Chart 1789.

SUNGEI INDRAGIRI.—The Sungei Indragiri penetrates far into the interior, and arises from a confluence of several rivers with their sources in the Barisan gebergte; the main river runs first in a southerly direction and then turns eastward, being named Batang Kuantan until it leaves the Kwantan district, and Indragiri below. It discharges into the sea with a delta mouth.

The four navigable arms of the delta are Sapat Dalam, Kuala Ladjau, Batang Terbung and Batang Tuaka; the two latter are entered from Amphitrite baai (page 250). Batang Terbung is the most generally used arm; Kuala Ladjau is the deepest, and is the only serviceable channel for vessels with a draught of over 13 feet ($4^{m}0$) and a length of more than about 200 feet ($61^{m}0$). As the navigation in the Sungei Indragiri is almost entirely confined to vessels of the Koninklijke Paketvaart Maatschappij and small local steamers, no regular reports of the depths on the various bars are issued by the Netherlands Government; the latest information of the depths, so far as is known, is given hereafter with the description of the various arms of the delta. Local knowledge is necessary for their navigation.

The delta islands Air Tawar, Bangkong, Mas and Pisang are low and uniformly wooded. Tanjong Bakau (*Lat. 0° 21′ S., Long. 103° 47′ E.*), the eastern extremity of Bangkong, is situated nearly 40 miles northward of Tanjong Solok, and is a low point covered with high trees; it is fringed by a fairly steep-to bank of soft mud, on which are numerous huts on piles. There are numerous fishing stakes in the mouths of Sungei Indragiri.

Sapat Dalam.—Directions.—Sapat Dalam, the southern mouth of the delta of Sungei Indragiri, with its entrance about 15½ miles north-north-westward of Tanjong Labu (page 243), runs along the western side of Air Tawar, and is narrow and tortuous at its inner end. A large bank, which dries, lies close off the southern side of Air Tawar and off the entrance to Sapat Dalam; the channel between this bank and the southern coast of Air Tawar has silted up, and is not navigable now for power vessels. The southern channel lies between this bank and a bank which dries out for about 3 miles from the coast immediately southward of the entrance to Sapat Dalam. This channel should be approached with the southern entrance point bearing 309° until a position 6 miles from that point is reached; in this position the bar, on which there was a least depth of 2¼ fathoms ($4^{m}1$) in 1929, should be crossed on a course of 325°, so as to pass about 1½ cables north-eastward of the eastern extremity of the coastal bank. The north-eastern side of this bank is steep-to, and at low water plainly indicates the channel. The least depth in this arm is off the inner entrance, where there is a bar with a depth of about one fathom ($1^{m}8$), in 1934, which must be crossed to reach the deep channel which runs here along the northern bank of Sungei Indragiri. A Custom station is situated on the northern side of the entrance.

Sungei Enok discharges into the western bank of Sapat Dalam about 1¾ miles within the entrance, and has depths varying between one and 2¾ fathoms ($1^{m}8$ and $5^{m}0$), but it is difficult to navigate on account of driftwood and fixed timber. It is fully one cable broad at the mouth, but narrows to only a quarter of a cable at Enok, a small village about 15 miles upstream; in the neighbourhood of this village the overgrowth is somewhat broken by rice fields.

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

Sungei Niur enters the western side of Sapat Dalam about 7 miles above Sungei Enok, and has depths of over 2¾ fathoms ($5^{m}0$) throughout; both banks are overgrown with nipa palms.

Kuala Ladjau.—Kuala Ladjau (Lajau) runs in a general westerly direction between the northern side of Air Tawar and the southern side of Bangkong and is entered between the mudbanks which extend from these islands; outside these banks and south-westward of Tanjong Bakau there is a bar, with a least depth of 2½ fathoms ($4^{m}6$) in the channel through it, in 1951. This channel is recommended for power vessels. Cuhoorn bank, with a least depth of 4 feet ($1^{m}2$) over it, lies on the northern side of this channel and about 8 miles west-south-westward of Tanjong Bakau (*Lat. 0° 21′ S., Long. 103° 47′ E.*). The southern entrance point of Kuala Ladjau is only noticeable owing to the dark background; a dilapidated building, formerly a Custom house, stands on this point. Kampong Bela, built on piles, is situated on the northern side of the entrance.

Directions.—From a position bearing 211° distant 4½ miles from Tanjong Bakau, a vessel should steer 244° for a distance of 3¾ miles; thence a course of 276° should be steered for 2¾ miles, passing fully half a mile southward of Cuhoorn bank; and thence a west-north-westerly course should be maintained until abreast the southern entrance point, when a mid-channel course can be held. Owing to the numerous fishing stakes in the vicinity, some of which are covered at high water, mariners are strongly recommended to use this channel by day only.

Tidal streams.—In Kuala Ladjau, eastward of the meridian of 103° 42′ E., the stream sets strongly south-westward on the rising tide and north-eastward on the falling tide. Westward of the above meridian the streams follow the channel.

Batang Terbung.—Light.—Batang Terbung, between Bangkong on the eastern side, and Pisang and Mas on the western side, is entered from Amphitrite baai, and is generally used by Chinese junks proceeding to Prigi Radja (Raja) on the eastern coast of Pisang, and thence to Sungei Indragiri. Although these junks frequently ground in Amphitrite baai, it is the shortest route from Singapore, and, with contrary winds, they can anchor in the bay. A large bank, which dries, and on which the island Beting, covered with vegetation, has formed, is situated off the entrance to Batang Terbung; there are numerous dwellings on piles, and also fishing stakes, on the edges of this bank and also on the coastal bank which extends from the northern side of Bangkong.

Prigi Radja (Raja) (*Lat. 0° 15′ S., Long. 103° 29′ E.*), situated about 3 miles south-westward of Tanjong Muara Pisang, the western entrance point of Batang Terbung, is a large village which carries on a considerable trade with Singapore. There is a landing pier here, but it dries. A light, maintained privately, is exhibited from the flagstaff of the Custom station. Prigi Radja is visited both by the Koninklijke Paketvaart Maatschappij and Chinese steamers. The limits of the roadstead are the lines drawn 135° from two beacons situated on the western bank and about 3 cables on either side of the Custom house. Vessels proceeding above this village must take a Custom's officer on board.

Batang Terbung is entered with a mid-channel course. In 1949,

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

the mudbank off Beting was extending eastward and there was a least depth of about one fathom ($1^{m}8$) in the channel east-south-eastward of that island. On the inner bar, where this arm joins the Sungei Indragiri, there was a least depth of 1¼ fathoms ($2^{m}3$) in 1929; the eastern side is held here, as a mudbank extends from the western side.

Batang Tuaka.—Directions.—Batang Tuaka flows along the northern sides of Pisang and Mas, and is used by power vessels. Trusan Batang, between these two islands, is not navigable.

To enter Batang Tuaka a westerly course should be steered to pass between the bank on which Beting is situated and a similar bank about one mile northward; on the northern edge of the latter bank is the island Busung, which is covered with vegetation.

This course should be maintained until Kuala Gaung Custom station, situated about 2½ miles north-north-eastward of the western part of Beting, bears 000°, when the northern bank should be followed at a distance of about half a mile. When about 1½ miles south-westward of Tanjong Penageh (*Lat. 0° 10′ S., Long. 103° 28′ E.*), situated about 2 miles south-westward of Kuala Gaung, the southern bank should be held. In 1929, the least depth in this route was 1¼ fathoms ($2^{m}3$), off Tanjong Penageh; the depths throughout Batang Tuaka varied between 1¼ and 3¾ fathoms ($2^{m}3$ and $6^{m}9$) in 1934.

Trusan Mas, the channel along the western extremity of Mas which connects Batang Tuaka with the Sungei Indragiri, is fully 1½ cables broad; in 1929 a least depth of 2¾ fathoms ($5^{m}0$) could be reckoned on over a channel about 1¼ cables broad. Pantekuk bank, of hard sand, with a depth of only 2 feet ($0^{m}6$) over it, lies off the southern entrance to Trusan Mas; the channel is westward of this bank, and, in 1929, had a depth of 1¾ fathoms ($3^{m}2$).

Sungei Indragiri above the delta.—The depths in the broad, navigable channel of the river as far as Tempuling Sungei Salak, a village about 30 miles upstream, are throughout as much as or considerably more than the least depth on the bar off Kuala Ladjau, which is the deepest entrance; vessels of considerable size can, therefore, proceed up to this village, and there is sufficient space there to swing at anchor.

There are several villages along the banks of the river. Kampong Sapat, situated on the southern side of Mas and about 1½ miles above the junction of Sapat Dalam with Sungei Indragiri, is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij; Kampong Teluk Dalam is also situated on the southern side of Mas, near the southern entrance to Trusan Mas. Each of these villages has a prominent mosque. The deepest channel in this portion of the river is along the southern side of Mas, but from Kampong Sapat to a distance of about 2 miles upstream this bank must be given a berth of about a quarter of a cable owing to submerged tree trunks.

Kampong Tembilahan, a village on the north-western bank about 6 miles above Teluk Dalam, is the headquarters of a Government official and is an important native market place; it is visited regularly by vessels of the Koninklijke Paketvaart Maatschappij and small Chinese steamers trading with Singapore. There is radio communication with Rengat, so that information of the water level in the upper reaches of the river can be obtained here. There is a **T**-shaped pier, which was in a very dilapidated condition in 1951, with a depth of

Charts 2757, 2660a, 941a, 1263.

10 feet (3m0) alongside its head; a light, maintained privately, is exhibited on the head of this pier. Kampong Tembilahan contains a small Government hospital and a Custom house; it is an important native market place. The limits of the roadstead of Rede Tembilahan are the meridian of 103° 11′ E. and the line drawn 135° through the mosque of Kampong Pendjamahan kechil, a village about 1½ miles above Kampong Tembilahan.

Kampong Pulu Palas, a village on the north-western bank about 6 miles above Kampong Tembilahan, has regular steamer communication and can be identified by its prominent mosque; there is a wooden pier off the village. Pulu Palas is an islet close off the southern bank and about three-quarters of a mile south-westward of the village.

Kampong Tempuling Sungei Salak, situated on the north-western bank about 7 miles above Kampong Pulu Palas, is an important native market place; there is a pier here. The roadstead off the village is spacious and deep; it is the farthest upstream anchorage for vessels of any size.

Vessels with a length of 200 feet (61m0) and a draught of not more than 10 feet (3m0) can proceed up the river to about half a mile above Kampong Teluk Bagus, a village about 24 miles above Kampong Tempuling Sungei Salak (*Lat. 0° 27′ S., Long. 103° 00′ E.*), where there are extensive rubber plantations; there is sufficient room for a vessel to anchor and swing off this village. No regular tide was observed in this reach of the river; the variation between mean level and chart datum being gradually less proceeding upstream. The mean level is affected by the water level in the upper river. Sungei Tjenako discharges into the south-western bank of Sungei Indragiri about one mile above Kampong Teluk Bagus, and from here onwards the permissible length and draught of vessels is considerably lessened, as the river becomes narrower, shoaler, and tortuous. Vessels with a length of 130 feet (39m6) must exercise the utmost caution when rounding a steep-to bank which extends from the eastern bank of the river opposite Sungei Tjenako; there are frequently heavy whirlpools off the mouth of Sungei Tjenako caused by the irregular depths and the meeting of the streams of that river and Sungei Indragiri. If possible it is advisable to wait for slack water to pass this point.

Rengat, on the south-eastern bank about 25 miles above Kampong Teluk Bagus, is the headquarters of a Government official. The place is visited regularly by small power vessels of the Koninklijke Paketvaart Maatschappij when water levels permit. There is a depth of nearly 3 feet (0m9) at the landing pier on the quay side when the tide gauge shows 10 decimetres. The limits of the roadstead are the parallels drawn about 2¾ cables northward and southward of the landing pier.

Tide gauges.—In addition to the tide gauge at Rengat, there are tide gauges about half a mile above and below Pelor bank, which extends from the north-western bank about 1¾ miles above the mouth of Sungei Tjenako. The tide gauge on the eastern bank below Pelor bank is divided into feet, and the one on the western bank above Pelor bank is divided into decimetres up to 38 decimetres, but with a higher water level it is covered. A tide gauge, divided into feet, is situated on the southern bank of the river near the upstream part of Kampong Djumahat, a village about 2½ miles above Pelor bank; this

Chart 1789.

gauge gives the depth on the bar off that village. Another tide gauge, divided into feet, is situated on the western bank of Sungei Indragiri at the northern end of Kampong Sungai Radjah, about 6 miles below Rengat, and indicates the depth at the landing jetty at Rengat (*Lat. 0° 23′ S., Long. 102° 33′ E.*).

At Rengat the lowest observed level on the gauge since 1925 is 10 decimetres. The highest and lowest tide gauge readings in decimetres from 1925 to 1929 were: January, 58 and 20; February, 58 and 33; March, 58 and 26; April, 58 and 29; May, 54 and 23; June, 45 and 15; July, 48 and 13; August, 30 and 11; September, 50 and 10; October, 56 and 18; November, 59 and 26; December, 58 and 28.

Directions.—Depths.—Above the mouth of Sungei Tjenako navigation is entirely dependent on the height of water level as shown by the above tide gauges. It should be borne in mind that Pelor bank acts more or less like a weir; with an in-going tide the downstream tide gauge sometimes shows more than the upstream gauge, and with an out-going tide the reverse takes place. In this reach of the river a regular tide was still observed until just beyond the sharp, narrow bend off Pulu Gelang, 10 miles above the mouth of Sungei Tjenako, strongly affected by the water level in the upper reaches. When the water level in the upper reaches is not too low and with a flood tide, a vessel with a draught of 6 feet ($1^{m}8$) can pass over the shoalest part of the river lying between the mouth of Sungei Tjenako and Pulu Gelang. A vessel must keep close under the northern shore in order to pass the sharp, narrow bend off Pulu Gelang. The southern bank of the mouth of Sungei Rengat, which discharges into Sungei Indragiri opposite Pulu Gelang, is very low and there may be whirlpools off this mouth. Favourable anchorage, to await daylight if necessary, can be obtained about 1½ miles below Pulu Gelang. Between Pulu Gelang and Rengat the depths shown on the chart should be decreased by 3 feet ($0^{m}9$) in order to pass safely over silted-up tree trunks; this applies especially in the channel northward and eastward of Kampong Kemudi, about 2 miles above Pulu Gelang, off Kampong Sungai Radja, a further 4 miles upstream, and off the various villages between the latter place and Rengat (*Lat. 0° 23′ S., Long. 102° 33′ E.*).

Sungei Indragiri above Rengat.—A vessel wishing to proceed up Sungei Indragiri above Rengat should take a pilot; the tide gauge at Rengat should show at least 33 decimetres, with rising water, before the journey is started. The numerous bends and heavy tree trunks, which higher up stand in mid-channel, make navigation very difficult. Kampong Peranap, a village about 55 miles above Rengat, was visited, in 1888, by a Government steam vessel. The river above that place was reported to be navigable by small power vessels, with a draught of not more than 7 feet ($2^{m}1$), as far as Kampong Tjerenti, approximately 4 hours steaming above Kampong Peranap. Beyond Kampong Tjerenti the river is not navigable even by praus at low water level, but with high water levels a power boat can proceed up-river for a few days. Whilst lying at anchor in any part of the river above Rengat, it is advisable to sound continuously and obtain information from the villagers as to whether the water is rising or falling to avoid being shut in.

The water level at Rengat gives no indication of the level at Kampong

Charts 2757, 2660a, 941a, 1263.

Peranap, but it may be accepted that rising of the water level at the former place will not be noticed at Kampong Peranap until 3 days later, and vice versa. At Kampong Peranap the water level may rise 6 feet (1m8) or even more in one day.

AMPHITRITE BAAI.—Amphitrite baai, entered between Tanjong Bakau (*Lat. 0° 20′ S., Long. 103° 47′ E.*) and Tanjong Dato, about 20 miles northward, has low, marshy shores, and the greater part is very shallow owing to the deposit carried down by the numerous rivers which discharge into the bay. Broad mudbanks, which dry, extend from the northern and southern shores of the bay ; the greatest depths are found southward of the bank which extends from the northern shore. A bank, which dries, extends nearly 1½ miles eastward from Tjawang (Chawang), an island near the north-western shore. The two detached banks, on which are the islands Beting and Busung, have been described on pages 246, 247.

The bottom throughout consists of soft mud, and the shores can be approached by sounding ; there are no landmarks, as the shores present a uniformly wooded appearance. Fishing stakes are frequently found in the channels leading to the rivers, and there are numerous dwellings on posts on the banks. Tanjong Dato is, like Tanjong Bakau, a low point wooded with high trees ; the entire neighbourhood is covered with trees of a similar height. Tanjong Bakau can be distinguished from Tanjong Dato as the trees at the former place, when seen from eastward, decrease rapidly in height southward and very gradually northward. Pile dwellings stand in the water off both points.

Vessels approaching the bay on a westerly course, when out of sight of Tanjong Dato or Tanjong Bakau, may be set considerably northward or southward by the tidal streams, which may attain a rate of 2½ knots. Vessels should, therefore, sound continuously, and it is advisable to steer for Tanjong Dato.

Tidal streams.—The horizontal movement of the water in Amphitrite baai is semi-diurnal. In the northern part of the bay the inflowing water runs westward, and in the southern part south-westward. The outflowing water runs north-eastward in the southern and middle parts, and between Tjawang and Busung ; in the northern part it sets across the mouths of Sungei Pelanduk, Sungei Igal and Sungei Mandah, and then curves eastward. The maximum rate observed was 3½ knots.

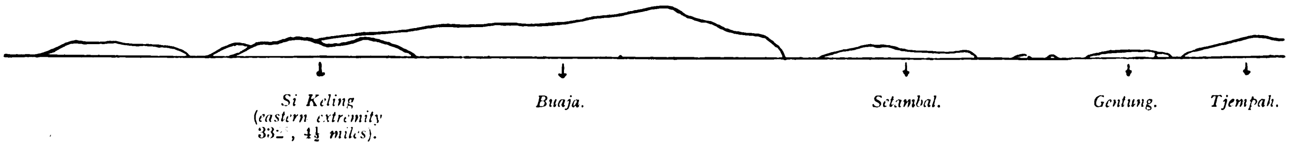
Outside the line Tanjong Dato to Tanjong Bakau the tidal streams set mainly north and south at rates up to 2½ knots in either direction.

For tidal streams in Kuala Ladjau, *see* page 246.

Rivers on the northern side of Amphitrite baai.—These rivers, which flow through sparsely populated, virgin forest, are only available for small vessels with local knowledge, and they are used by native craft for the export of sago to Singapore.

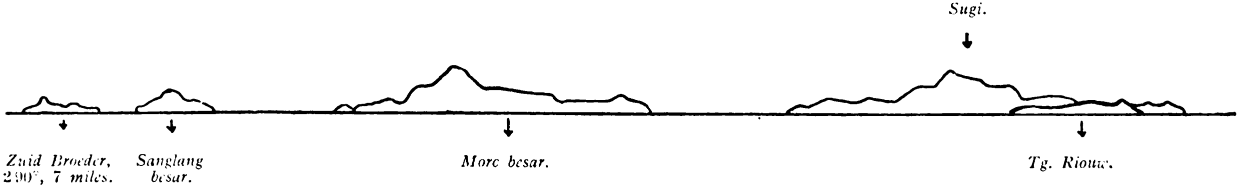
Sungei Anak Mandah discharges immediately westward of Tanjong Balo (*Lat. 0° 01′ S., Long. 103° 35′ E.*), situated about 13½ miles westward of Tanjong Dato, and has depths of from 5 to 14 fathoms (9m1 to 25m6) for a distance of 4½ miles upstream ; when entering this river Tanjong Balo should be passed at a distance of about half a cable. Sungei Ibu Mandah discharges close south-westward of Sungei Anak Mandah, and is easy to navigate for a distance of 9 miles ; the northern

To face page 250.



Southern approach to Straat Tjempah.

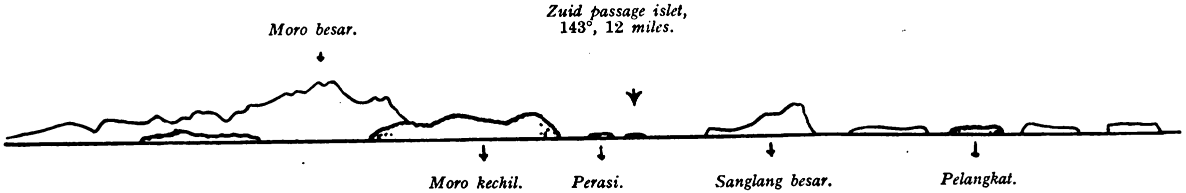
(Original dated 1949.)



Southern approach to Straat Durian from eastward.

(Original dated 1949.)

To face page 251.



Straat Durian, from north-north-westward.

(Original dated 1949.)

Chart 1789.

bank must be held, however, in a position about 3 miles within the mouth. Kuala Mandah is the joint estuary of these two rivers, and also of Sungei Untal; there is a Custom station, with a pier and flagstaff, on its southern side. Rede Mandah, northward of the Custom station, is bounded by the meridian about 7 cables eastward of the Custom station; the meridian through the western entrance point of Sungei Untal, situated about three-quarters of a mile westward of the Custom station; and the parallel of Tanjong Balo.

Rede Igal is northward of the Custom station on the northern extremity of Tjawang and on the southern side of Kuala Igal, which is the joint estuary of Sungei Igal and Sungei Pelanduk. Sungei Igal is only navigable as far as Kampong Polai, a village about 7 miles above the mouth; vessels must pass northward of Sengkajan, an islet about 2½ miles above the mouth, but elsewhere keep in mid-channel. Sungei Pelanduk is navigable for a distance of about 15 miles, a mid-channel course being held.

Sungei Rawang and Sungei Pendang, westward of Tjawang, are navigated with a mid-channel course. Sungei Bantaian and Sungei Alai discharge into Sungei Pendang and also should be navigated with a mid-channel course; the connecting channel between the former and Sungei Pelanduk, about 4 miles upstream, is very deep. Batang Tumu is entered between the southern side of Tjawang and Tanjong Rangga (*Lat. 0° 09′ S., Long. 103° 30′ E.*), about one mile southward of the south-western extremity of that island. The river can then be entered by passing through the channel between Tjawang and Busung, in which there are numerous fishing stakes, and then keeping midway between the southern coast of Tjawang and the drying bank extending south-westward from Busung. When Tanjong Muara Pisang (page 246) bears 190°, course should be altered to about 302° so as to bring Kuala Tumu Custom station, *see* below, just on the port bow; thence the chart is sufficient guide. Kuala Tumu Custom station is on the southern coast of Tjawang and close eastward of the mouth of Sungei Rawang.

Rede Gaung is southward of Kuala Gaung Custom station, which is situated about one mile south-westward of Tanjong Rangga. The limits of the roadstead are: the meridian through Tanjong Rangga; an imaginary line drawn 243° from the south-western extremity of Busung; an imaginary line drawn 135° from the north-eastern entrance point of Batang Gaung, situated about 1½ miles west-south-westward of Kuala Gaung Custom station. Anchorage can be obtained here in depths of 2¼ fathoms ($4^{m}1$); there is a landing pier and flagstaff at the Custom station. With rising water the roadstead can be reached either from the mouth of Batang Tumu or between the banks which extend from Busung and Beting.

To enter Batang Gaung, steer for the north-eastern entrance point bearing 315°, and when the flagstaff of Kuala Gaung Custom station bears 057° steer for Tanjong Penageh, the south-western entrance point, and follow this side of the river until within the entrance. The river is navigable as far as Simpang, a Chinese settlement about 30 miles above the mouth; there is also a Malay village here. The river is about a quarter of a cable broad off Simpang, and there is anchorage in a depth of 4¼ fathoms ($7^{m}8$), mud, with a hawser to the shore; if remaining for any length of time, fore and aft hawsers should

Charts 2757, 2660a, 941a, 1263.

Chart 1789.

be taken to both banks to prevent swinging. Anak Serka, a tributary of Batang Gaung, is navigable for light-draught vessels.

COAST.—Light.—The coast northward of Tanjong Dato is low, uniformly covered with vegetation, and has no conspicuous landmarks; a few unimportant rivers discharge along this coast.

The south-eastern entrance to Selat Pedada, the narrow passage which separates the island Kateman from the coast, is situated about 11½ miles north-north-westward of Tanjong Dato; the entrance dries, and it is not even navigable for praus.

Sungei Kateman, about 24 miles north-north-westward of Tanjong Dato, is entered between Tanjong Djongkir, the northern extremity of Kateman and the Sumatra coast, but is of no importance to general shipping. The direct approach, between Tanjong Djongkir and the south-eastern extremity of Burung, an island situated about 4 miles north-north-westward, has silted up and the mouth of the river can now only be reached by the channel between Burung and the Sumatra coast; the islands of Burung (*Lat. 0° 26′ N., Long. 103° 34′ E.*) and Kateman are difficult to distinguish. To proceed through this channel, the coastal bank which extends from the Sumatra coast north-westward of Burung should be crossed by keeping Seleman (chart 2402), an islet about 6 miles northward of Burung, bearing 058° astern; when Burung is almost entirely open north-eastward of Kateman a mid-channel course can be steered between the former island and the Sumatra coast. The least depth on this route was 2¼ fathoms ($4^{m}1$) in 1948. Tanjong Djongkir, as well as both banks of the river, is steep-to and thickly covered with mangroves. The mouth of the river is about half a mile broad, with a depth of 2¼ fathoms ($4^{m}1$), in 1948, which increases to 5 fathoms ($9^{m}1$) off Kampong Sungai Guntung (Genting), a large village about 3 miles within the entrance, where there is a Custom house and a Government pier.

There is a Chinese camp on the eastern bank about one mile within the mouth.

The Chinese in the neighbourhood exist by collecting timber, which is shipped to Singapore; the natives cultivate rice and sago, and are also employed fishing. Sungei Guntung, which discharges into Sungei Kateman opposite Kampong Sungai Guntung, is not navigable. The limits of the roadstead of Sungai Guntung are: the meridian about 5½ cables westward of the Custom house, and the parallels about 5½ cables northward and southward, respectively, of the Custom house (*Lat. 0° 17′ N., Long. 103° 36′ E.*).

For description of the channel between Durai (Durei) (page 253) and the Sumatra coast, *see* page 263. For details of light on Zuid Broeder (South Brother), *see* page 256.

Chart 2402.

STRAAT DURIAN.—Straat Durian, the main channel leading from the inner route to Singapore strait, runs along the eastern side of Kundur, an island lying with its southern extremity about 13 miles north-north-westward of Burung, and the islands lying northward of it; it is available for all classes of vessels, being deep and well lighted. In 1933-34 a channel, with a breadth of nearly 2 miles, was swept at a depth of nearly 8 fathoms ($14^{m}6$) through the strait. The approximate

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

position and limits of the swept area are given in the Directions on page 262. There is good anchoring ground on the western side of the strait, over mud and sand; in the middle the bottom is mainly sand and stones.

Numerous islands lie off the southern entrance of the strait, the two main passages between them being either eastward or westward of the Rukan eilanden; a third passage, which slightly shortens the route, is Zuidoostelijk vaarwater (South-east channel), between the Durai (Durei) group and the Segal eilanden. *See* view facing page 250.

Currents and tidal streams.—The character of the tidal streams in Straat Durian, as well as in Straat Sugi, Straat Sulit, and Straat Tjombol, is mixed, but the semi-diurnal predominates; the direction is northward and southward. As the times of the turn of the stream and the maximum rate occur in Straat Durian on an average 7 hours later than in Straat Berhala, the south-going stream in Straat Durian practically coincides with the stream setting west-north-west in Straat Berhala, and the north-going stream in Straat Durian coincides with the stream setting east-south-east in Straat Berhala; through both straits, therefore, the water runs simultaneously either in or out of the open area westward of Lingga archipel. The flow is inwards through Straat Berhala and Straat Durian while the tide is rising in Amphitrite baai, and outwards while it is falling there.

There is also a north-going current in Straat Durian; this attains a rate of three-quarters of a knot in December, January and February, and a quarter of a knot during the remaining months.

The tidal streams in the northern and southern approaches to Straat Durian (Doerian) (*Lat. 1° 00′ N., Long. 103° 34′ E. and Lat. 0° 40′ N., Long. 103° 42′ E., respectively*) are predicted in Admiralty Tide and Tidal Stream Tables. They set northward and southward; the predictions give the time of maximum rate in either direction, the times at which the streams turn and the maximum rate in either direction. To these predicted streams must be added the current described above.

The maximum rate of the south-going stream, including the current, may be expected to attain an average of 3 knots in June and July at 0200, and an average of 2½ knots in December and January at 1400, with semi-diurnal spring tides. The maximum rate of the north-going stream, including the current, can be expected to average 3 knots in December, January, and February, and 2½ knots during the remaining months, with semi-diurnal spring tides.

Charts 2402, 1789.

Islands and dangers off the southern entrance to Straat Durian.—Lights.—Durai (Durei) (*Lat. 0° 32′ N., Long. 103° 36′ E.*) lies with its southern extremity nearly 5 miles northward of the south-eastern extremity of Burung; it rises to a height of 230 feet (70^{m}1) near its northern end, and is the largest of a group of islands, mostly covered with mangroves, lying on the western side of Zuidoostelijk vaarwater (South-east channel). These islands all lie on a bank with very variable depths, and on which are numerous rocks awash and some reefs which dry. Sandam Laut, the south-easternmost of the Durai group, is situated about 3¾ miles east-south-eastward of the southern extremity of Durai; a drying reef and a 2¼-fathom (4^{m}1) patch lie about 3 cables south-westward and three-quarters of a mile

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2402, 1789.

south-south-westward, respectively, of this islet; depths of less than 3 fathoms ($5^{m}5$) extend about three-quarters of a mile southward, 1¾ miles eastward and 1¾ miles north-eastward from the same islet. A drying reef, with an above-water rock on it, extends from about 2 to 6 cables north-westward from Sandam Laut. Sandam Darat lies with its southern extremity nearly 1¾ miles east-south-eastward of the southern extremity of Durai, and the village of Kampong Sandam is situated on its north-western coast. The islet of Intjik Mail lies in the passage between Sandam Darat and Durai (*Lat. 0° 32′ N., Long. 103° 36′ E.*).

The islands of Berambang, Tengkok Biawa (Baiawak), Akat and Perasi, the last being 190 feet ($57^{m}9$) high and the northernmost of the chain, extend northward from Sandam Darat for about 3 miles; a 3-fathom ($5^{m}5$) patch lies nearly 1½ miles eastward of the southern extremity of Akat. The coastal reef off the northern extremity of Perasi extends northward for nearly 3 cables, and depths of less than 3 fathoms ($5^{m}5$) extend fully 3 cables from its eastern side and about 1½ miles north-westward from its northern extremity. The islet of Kodjok lies about a quarter of a mile south-westward of Perasi; foul ground exists between Perasi and the northern extremity of Durai.

Lang, an islet, is situated close off the northern extremity of Durai; a rock, which dries, and a 1¾-fathom ($3^{m}2$) patch lie about 2 cables north-eastward and three-quarters of a mile north-westward, respectively, of Lang; depths of less than 3 fathoms ($5^{m}5$) extend about 2¼ miles westward from Lang. A group of islets lie off the north-western extremity of Durai, the largest being Wabu, Seleman and Engkoasan, situated, respectively, about three-quarters of a mile south-south-westward, one mile south-westward and 1¼ miles southward of Lang. Depths of less than 3 fathoms ($5^{m}5$) extend up to 1¼ miles off the south-western coast of Durai, and a large drying reef lies close south-westward of its southern extremity, off Kampong Durai.

Chart 2402.

On the eastern side of Zuidoostelijk vaarwater are: Segal besar, 115 feet ($35^{m}0$) high, about 2 miles north-eastward of Perasi; Segal kechil (*Lat. 0° 35′ N., Long. 103° 39′ E.*), about 2 cables north-westward of Segal besar; Bukit Dua, 246 feet ($75^{m}0$) high, about 6 cables north-north-westward of Segal kechil; Ungkuwapa (Ungku Wapa), 175 feet ($53^{m}3$) high, about 2 cables north-westward of Bukit Dua; and the small islet of Bajan (Bajar) about a quarter of a mile south-westward of Bukit Dua. A rock awash lies about one cable south-eastward of Bajan, and there is a similar rock about 3½ cables east-north-eastward of the same islet. A shoal, with a least depth of 1½ fathoms ($2^{m}7$) over it, lies about 2 cables south-eastward of Bukit Dua, and there is a rock awash about half a mile north-eastward of the same island. Depths of less than 3 fathoms ($5^{m}5$) extend for about half a mile south-eastward from the south-eastern extremity of Segal besar, and two 5-fathom ($9^{m}1$) patches lie nearly 1¾ miles south-eastward and about 2½ miles south-south-eastward of the southern extremity of that island. Depths of less than 5 fathoms ($9^{m}1$) extend for about three-quarters of a mile north-westward from the southern extremity of Segal besar. Meja (Meia), nearly one mile west-south-westward of Segal kechil, is on the western side of the channel; a 4½-fathom ($8^{m}2$) patch lies about half a mile south-eastward of its

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

southern extremity. Zuidoostelijk vaarwater can only be used by day and by vessels with local knowledge.

Sanglang besar (False Durian) lies with its southern extremity about 2¾ miles north-eastward of Segal kechil, and is a thickly wooded, hilly island; Manilang (Manjlang), the summit, 645 feet ($196^{m}6$) high, is situated in the north-western part. The very prominent island Sanglang (Sanglar) kechil, 210 feet ($64^{m}0$) high, lies close off the south-eastern side of Sanglang besar and is also wooded; a reef, which dries, having a prominent tree on it, extends about 2 cables from its eastern extremity.

A bank, with depths of from 3¼ to 5 fathoms ($5^{m}9$ to $9^{m}1$) over it, extends about 1½ miles south-eastward from Sanglang kechil. Richardson rif, with a depth of 2¾ fathoms ($5^{m}0$) over it, lies nearly one mile northward of the eastern extremity of Sanglang kechil. Sanglang besar (False Durian) and the adjacent islands lie on the western side of the southern entrance to Straat Durian. The island of Kas, about half a mile westward of Sanglang besar, has two hills on it, the western being 157 feet ($47^{m}8$) high; the islet of Kadjoh (Kajo) lies in the passage between Kas and Sanglang besar, and Nipis lies close off the south-eastern coast of Sanglang besar. Depths of 2½ fathoms ($4^{m}6$) extend about 2 cables south-eastward from Ulat, an island lying close west-south-westward of Sanglang kechil.

Menterus lies on a sandbank nearly one mile southward of the eastern extremity of Kas; its eastern end is rocky. A bank, with depths of from 3 to 5 fathoms ($5^{m}5$ to $9^{m}1$), extends nearly 2½ miles south-eastward from Menterus; a shoal, with a least depth of 3 fathoms ($5^{m}5$) over it, lies about 3 miles south-eastward of Menterus; and a 3¼-fathom ($5^{m}9$) patch lies about three-quarters of a mile south-south-eastward of the same islet. Three drying reefs lie, respectively, about 4 and 7 cables northward and 1¼ miles north-westward of the eastern extremity of Kas. Benah, an islet, is situated about 2 cables northward of Kas, and Timun, 148 feet ($45^{m}1$) high, lies about 4 cables north-north-westward of Benah; depths of less than 5 fathoms ($9^{m}1$) extend nearly three-quarters of a mile northward from Benah. Mepa is situated about three-quarters of a mile eastward of Benah; a drying patch and a 3-fathom ($5^{m}5$) patch lie about 2 cables westward and north-westward, respectively, of the islet, and depths of less than 5 fathoms ($9^{m}1$) extend about one mile north-north-westward from the same islet. Three small islets lie on a drying bank which extends for about 6 cables north-westward from the northern extremity of Sanglang besar; a shoal with depths of from 4½ to 5 fathoms ($8^{m}2$ to $9^{m}1$) extends from 1¼ to 2¼ miles north-westward of the same point.

The Rukan (Rukau) eilanden lie in the middle of the southern approach to the strait, and consist of the three islands Zuid Broeder (South Brother), Middel Broeder (Middle Brother) and Noord Broeder (North Brother). Zuid Broeder (*Lat. 0° 33′ N., Long. 103° 47′ E.*), situated about 4½ miles south-eastward of Sanglang kechil, is 203 feet ($61^{m}9$) high and is the largest and highest; a very prominent rock lies close off the south-western point, and a rocky islet, with a rock awash close southward of it, lies close off the south-eastern side of the island. There is a 5½-fathom ($10^{m}1$) patch about half a mile south-south-eastward of the south-eastern extremity of Zuid Broeder. A 7½-fathom ($13^{m}7$) patch lies about 4 miles east-south-eastward of the

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

south-eastern extremity of Zuid Broeder, and a 6-fathom ($11^{m}0$) patch lies about 1¾ miles east-north-eastward of the northern extremity of this island. Middel Broeder, 153 feet ($46^{m}6$) high, is situated about 1¼ miles northward of Zuid Broeder. A shoal, with a depth of 5 fathoms ($9^{m}1$), lies about half a mile south-south-eastward of the south-eastern extremity of Middel Broeder, and there is a coral patch, with a depth of 3¼ fathoms ($5^{m}9$), nearly one mile north-westward of the north-western extremity of this island. Noord Broeder, nearly 3 miles north-north-westward of Middel Broeder, is a rocky islet, 93 feet ($28^{m}3$) high, covered with vegetation, and a reef extends nearly one cable from its southern side; a rock awash lies about 6 cables south-eastward of Noord Broeder, and a drying reef lies nearly one mile south-south-eastward of the islet.

A light is exhibited, at an elevation of 225 feet ($68^{m}6$), from a white iron framework structure, 72 feet ($21^{m}9$) in height, situated on a hill on the southern end of Zuid Broeder. *See* also chart 1789.

A light is exhibited, at an elevation of 93 feet ($28^{m}3$), from a white iron light-beacon, 43 feet ($13^{m}1$) in height, situated in the centre of Noord Broeder (*Lat. 0° 38′ N., Long. 103° 46′ E.*).

Ooster banken (Eastern bank) lie on the eastern side of the southern approach to Straat Durian, and are ridges of hard sand with depths of from 1½ to 5 fathoms ($2^{m}7$ to $9^{m}1$) over them, which are not marked by surf or discoloration; the western ridge lies about 4½ miles east-north-eastward of Noord Broeder, and these banks extend about 3 miles north-north-eastward, 4 miles north-eastward, 5 miles eastward, 6½ miles south-eastward and 2 miles south-south-eastward from the western ridge. There are two detached shoals, with depths of 4½ fathoms ($8^{m}2$) over them, southward of these banks; the southern shoal lies about 7 miles east-south-eastward of Noord Broeder, and the northern shoal is about 5½ miles eastward of this islet. A 6-fathom ($11^{m}0$) patch lies nearly 6 miles east-south-eastward of Noord Broeder.

Islands and dangers on the eastern side of Straat Durian.—Moro besar (Great Durian) is a hilly island lying with its southern extremity nearly 4 miles north-north-westward of Noord Broeder; Djora (Jora), the summit of the island, is 1,009 feet ($307^{m}5$) high and is situated nearly in the centre. A bank of sand and mud, with depths of less than 5 fathoms ($9^{m}1$), extends nearly 2 miles from the eastern coast. A 3-fathom ($5^{m}5$) patch lies about 2¼ miles north-north-eastward of the south-eastern extremity of Moro besar and three-quarters of a mile offshore. The south-western coast is fringed by a narrow, steep-to reef.

Pulau Tiga are three rocky islets lying within half a mile of the southern coast of Moro besar. Carnbee rif, which dries, lies about one mile south-westward of the southern extremity of Moro besar and is steep-to. Perasi (North Passage islet) (page 261) open westward of Moro kechil (Little Durian) leads well clear south-westward of Carnbee rif.

Moro kechil (Little Durian) is separated from the western side of Moro besar by a narrow strait having three islets in it; depths of less than 3 fathoms ($5^{m}5$) extend about half a mile from its south-eastern side; the summit of the island, 556 feet ($169^{m}5$) high, is situated in the north-eastern part. A rock awash lies about a quarter of a mile off

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

the south-western coast and about 9 cables north-westward of its southern extremity; the northern coast is steep-to.

Sugi Bawah (Bawa) lies with its southern extremity about 1½ miles northward of the northern side of Moro besar, and has a range of hills, rising to a height of 475 feet ($144^{m}8$), in the northern part; the village of Pengu is situated at its southern end. The western side of the island is mostly swamps and mangroves, and there are several reefs within half a mile of the coast and between 2 and 4 miles north-westward of its southern extremity; an islet lies about half a mile south-westward of its northern extremity. Ijan (Jan) is an island lying close off the southern extremity of Sugi Bawah; a drying reef lies about one cable off its south-western coast.

Moro Darat (*Lat. 0° 46′ N., Long. 103° 41′ E.*), Moro Tengah (Tenga) and Moro Laut are situated, respectively, about 1¼, 1¾, and 2½ miles west-north-westward of the southern extremity of Sugi Bawah. Two reefs, which dry, lie within a distance of 7 cables west-north-westward of Moro Laut, the outer island, and the depths in the vicinity are very irregular. A 4-fathom ($7^{m}3$) patch lies about 4 cables south-eastward of the northern extremity of Moro Laut, and a 3¼-fathom ($5^{m}9$) patch and a 5-fathom ($9^{m}1$) patch lie, respectively, about half a mile northward and three-quarters of a mile north-eastward of the same point. There is a 3¼-fathom ($5^{m}9$) patch about 4 cables south-eastward of the southern extremity of Moro Darat. The strait between all these islands and the northern side of Moro besar and Moro kechil appears to be clear and deep on the southern side, but no advantage would be gained by using it. Depths of less than 5 fathoms ($9^{m}1$) extend about half a mile south-south-eastward from the southern extremity of Moro Tengah and a shoal, with depths of from 4 to 5 fathoms ($7^{m}3$ to $9^{m}1$), lies within 6 cables of its south-western side. Manda, with a smaller islet and a rock awash within a distance of half a mile westward of it, lies in the middle of the eastern entrance. In 1946, a shoal, dangerous to navigation, was reported to exist in the centre of the channel between Moro besar (Great Durian) and Ijan, about 7 cables north-eastward of the south-eastern extremity of Manda.

Belukar is a low, wooded island lying about half a mile north-westward of the northern extremity of Sugi Bawah; a reef, which dries, lies nearly 1¼ miles westward of the southern extremity of Belukar, and a 6-fathom ($11^{m}0$) patch lies nearly 2 cables southward of this reef. Manilang (page 255), the summit of Sanglang besar (False Durian), in line with the north-western extremity of Moro kechil, bearing about 168°, leads close westward of this reef and also westward of the two reefs off Moro Laut. A reef, with a depth of 5 feet ($1^{m}5$) over it, and a reef which dries, lie about half a mile and 1¼ miles, respectively, north-westward of the northern extremity of Belukar (*Lat. 0° 50′ N., Long. 103° 39′ E.*).

Pandjang is a hilly island, rising to a height of 440 feet ($134^{m}1$) in the southern part, lying about 1¼ miles eastward of Belukar, and a long, narrow sandbank, with a least depth of 3 feet ($0^{m}9$), lies about midway between these two islands. A rock, covered with vegetation, and a reef which dries, lie close off the northern extremity of Pandjang; and there is an islet nearly half a mile southward of the same point.

Charts 2402, 2403.

Islands and dangers on the western side of Straat Durian.—

Charts 2402, 2403.

The group of islands which forms the western side of Straat Durian, of which Kundur is the largest, is of little importance to vessels passing through this strait, as there are few noticeable landmarks. All the islands are low over the greater part; the only prominent peak is Papan, 652 feet ($198^{m}7$) high, situated in the western part of Papan and about 3 miles eastward of the northern extremity of Kundur. Salah, a hill 422 feet ($128^{m}6$) high, is situated on the northern extremity of Kundur; Tas and Gading (chart 1355), 393 and 465 feet ($119^{m}8$ and $141^{m}7$) high, respectively, are situated near the southern extremity of the island.

Chart 2402.

Onggut (Ungar), with Tanjong Batu Lima, its south-western extremity, situated nearly one mile south-south-eastward of the south-eastern extremity of Kundur, lies close off the south-eastern side of Kundur. There are several rocks, with depths of from 2 to 2¾ fathoms ($3^{m}7$ to $5^{m}0$) over them, within one mile of the southern coast of Onggut; they are all very small and are usually marked by tide-rips. Batu Blian, an above-water rock, lies about half a mile south-eastward of Tanjong Batu Blian, the south-eastern extremity of Onggut, and a 2¾-fathom ($5^{m}0$) rocky patch lies nearly 3¾ miles south-south-westward of Tanjong Batu Blian. Kampong Tandjung Batu is situated on the south-eastern coast of Kundur about 2 miles northward of Tanjong Batu Lima, and a rock above water lies close off the northern house of the village. The Netherlands steamer *Glatik* anchored close off this village, in a depth of about 5 fathoms ($9^{m}1$). The anchorage is approached from southward, but Tanjong Batu Lima must be given a berth of about three-quarters of a mile as a mudbank, with some rocks on it, extends about half a mile westward from this point. If approaching from eastward a vessel should steer for the south-eastern point of Kundur as soon as it bears 030°, sounding continuously, and when abreast of the drying rock westward of Tanjong Batu Lima, a mid-channel course should be followed. The south-going tidal stream in the channel between Onggut and Kundur attains a rate of from 2 to 3 knots. Mandah (Manda) lies about a quarter of a mile northward of Onggut; the eastern entrance to the channel between these islands is foul.

Tiabung, an islet, lies about 3 miles south-eastward of Tanjong Batu Blian. Three islets, Biajawak, Buaja and Musang, lie between 2 and 2½ miles eastward of Tiabung, and there is a rock awash about 2 cables east-south-eastward of Musang (*Lat. 0° 35′ N., Long. 103° 34′ E.*). Tikus, a drying reef, is situated about three-quarters of a mile northward of Biajawak and a rock awash lies midway between. About 1¾ miles northward of Biajawak is the islet of Tengah Laut. A reef extends about 2 cables south-eastward from Tengah Laut, and a rock awash and a 3¼-fathom ($5^{m}9$) patch lie, respectively, about 2 cables southward and south-westward of the islet. There is an unnamed islet about 3 cables north-westward of Tengah Laut.

Tengah Tengah and Tengah Darat are two islets nearly three-quarters of a mile and about one mile, respectively, north-north-westward of Tengah Laut. An above-water rock is situated about 2 cables westward of Tengah Tengah. There are two rocks awash about 3 cables north-westward of Tengah Darat, and a drying stony patch lies about three-quarters of a mile north-north-westward of the same islet.

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

Sekadjang (Sekajang) besar is situated nearly 1½ miles north-eastward of Tengah Darat. The islets of Merambung and Sekadjang (Sekajang) kechil lie, respectively, about 2 cables south-eastward and 3 cables north-eastward of Sekadjang besar. Eastward of the above islands a bank, with depths of from 3 to 5 fathoms (5^m5 to 9^m1), extends from a position nearly one mile east-north-eastward of Sekadjang kechil to nearly one mile north-north-eastward of Buaja ; its eastern side lies nearly 3½ miles eastward of Tengah Laut.

The small islet of Nangka is situated nearly half a mile north-north-westward of Sekadjang besar. About one mile north-westward of Sekadjang besar is Tjempeda (Chempeda), another islet.

Bukit Dua (*Lat. 0° 41′ N., Long. 103° 33′ E.*), a hilly islet with two peaks, lies about half a mile northward of Tjempeda and on the outer edge of the shoal water, with depths of less than 3 fathoms (5^m5), which extends eastward from the coasts of Onggut and Kundur. Babi, a hilly islet, and Mendulung are situated, respectively, about half a mile northward and 6 cables west-north-westward of Bukit Dua. Several islets, including Ingit Ingit and Mesajuh (Mesayu), and some drying rocks lie westward of Mendulang and Babi, and there is a rock awash about 2 cables south-eastward of Babi.

Mangas and Antu are two small islets about 9 cables south-south-eastward and 4 cables east-south-eastward, respectively, of Babi ; a 3-fathom (5^m5) patch and a rock awash lie, respectively, about half a mile south-eastward and 3 cables east-north-eastward of Antu. Piatu, another islet, is situated about three-quarters of a mile northward of Antu, and two 3-fathom (5^m5) patches lie about 2 cables southward and half a mile northward of Piatu.

Charts 2402, 2403.

Close off the north-eastern coast of Kundur is the island of Belat which is separated from Kundur by a passage navigable by praus ; several villages border the sides of this passage. Degong lies close south-eastward of Belat and is separated from it by a channel, with depths of from 3 to 12 fathoms (5^m5 to 21^m9), in which there is an islet, but the entrances are very shallow.

The islet of Seraja is situated about 3 cables south-eastward of the south-eastern extremity of Degong, and the islets of Menotos and Sluwang lie, respectively, about 2 miles south-eastward and 1¼ miles eastward of the same point. About 6 cables northward of Seraja is Tikus, a small islet lying off the eastern coast of Degong.

There are several islets in the passage between Kundur and Belat ; Teriman, the south-easternmost one, lies about 6¼ miles south-eastward of the northern extremity of Kundur. There is a rock awash in mid-channel about half a mile south-eastward of Teriman. Tebias is situated close northward of Teriman and there is a narrow channel, with a least depth of about 2 fathoms (3^m7) between Tebias and Belat. Sabuntah and an unnamed islet lie close north-westward of Teriman. Between 2¾ and 4 miles south-eastward of the northern extremity of Kundur are the islands of Kisar, Semuntah and Sependu. A small islet lies close north-eastward of Sependu.

The islet of Menokot (*Lat. 0° 54′ N., Long. 103° 24′ E.*) is situated in the centre of the north-western entrance to the channel between Kundur and Belat and about one mile east-south-eastward of the northern extremity of the former ; depths of less than one fathom

Charts 2402, 2403.

(1^{m}8) extend for about 6 cables north-westward and 8 cables south-eastward from this islet. There are several islands on either side of the north-western approach to this channel, including Setunah and Nangka, 301 feet (91^{m}7) high, on the south-western side, and Ketam and Rengat on the north-eastern side lying, respectively, about 2 cables and one mile north-westward, nearly 1½ miles east-north-eastward and 1¾ miles north-north-eastward of the northern extremity of Kundur. Depths in the vicinity are very irregular and there is less than 2 fathoms (3^{m}7) over the bar. For Straat Gelam, *see* Malacca Strait Pilot.

There are several islets within half a mile of the north-eastern coast of Belat, including Penisil, Telipo (Pelipo), Man, Djumahat (Jumahat), Kedi and Patjet (Pachet), the northernmost one, which is situated about 5 miles north-north-westward of the southern extremity of Belat.

The island of Papan lies close northward of Belat and is separated from it by a deep passage, available for praus, which can be entered south-westward of Patjet. There is a rock awash near the southern side of this passage about 2 miles within the eastern entrance. This passage has a common north-western entrance with the channel between Kundur and Belat.

The three islands of Lumut, Tulang and Parit lie northward of Papan and are separated from each other by narrow passages; those between Lumut and Papan and between Lumut and Parit having a least depth of 5 fathoms (9^{m}1), and that between Papan and Tulang having a least depth of 2¾ fathoms (5^{m}0). In the common eastern entrance, which has a least depth of about 5 fathoms (9^{m}1), there are three islets, namely Nibung, Belongkin and Rengat. The western entrances are shoal and there are two rocks awash about 2 cables northward of the north-western extremity of Tulang, also an islet and an above-water rock, lying close together about 1½ miles south-westward of the same point.

Buru (*Lat. 0° 53′ N., Long. 103° 30′ E.*) is situated about half a mile eastward of Papan and is separated from it by a deep and clear channel, with a least depth of about 6 fathoms (11^{m}0) in the fairway. The southern approach to this channel is across a spit, with depths of less than 3 fathoms (5^{m}5), which extends north-north-eastward from Degong; there is a depth of 2½ fathoms (4^{m}6) in mid-channel on this spit about 4 cables north-eastward of Kedi. There are several villages on Buru and a mosque is situated about one mile north-westward of Tanjong Ambat, its southern extremity.

Depths of less than 3 fathoms (5^{m}5) extend for about three-quarters of a mile from the eastern coast of Buru and there are a number of drying patches and above-water and sunken rocks within this distance.

A 5-fathom (9^{m}1) patch lies about 2 miles east-north-eastward of Tanjong Ambat. About 2¼ miles eastward of Tanjong Pengelih, the northern extremity of Buru, there is a 3-fathom (5^{m}5) patch, and a 5¼-fathom (9^{m}6) patch lies about 3¾ miles eastward of the same point.

Chart 2402.

Pandan besar and Pandan kechil are situated about one mile and 1½ miles, respectively, northward of Tanjong Pengelih, near the northern end of a spit, with depths of less than 3 fathoms (5^{m}5) over it, which extends northward from Buru and which has its north-western extremity about three-quarters of a mile north-westward of Pandan besar. There are several drying rocks between Pandan besar (*Lat. 0° 57′ N., Long. 103° 29′ E.*) and the coast of Parit, and two drying reefs lie close off the southern side of Pandan besar.

In the eastern approach to Straat Gelam, which is northward of Pandan kechil, there are several shoals, with depths of from 3 to 5 fathoms ($5^{m}5$ to $9^{m}1$), the positions of which can best be seen from the chart. For Straat Gelam and the islands northward, *see* Malacca Strait Pilot.

Islets and dangers near the fairway through Straat Durian.—Lights.—Ngal, an island, is situated nearly 3½ miles eastward of the northern extremity of Onggut; a rock awash lies about a quarter of a mile off the north-eastern side of Ngal. Shoal patches, with depths of 5 and 6 fathoms ($9^{m}1$ and $11^{m}0$) over them, lie about one mile northward and 1¼ miles north-north-eastward, respectively, of Ngal. A spit, with depths of less than 3 fathoms ($5^{m}5$) over it, extends for nearly 1½ miles north-north-westward from the northern extremity of Ngal. Peropos, 485 feet ($147^{m}8$) high, lies close southward of Ngal, and Pandjang (Panjang) lies between Ngal and Degong and about 2 miles north-north-westward of the former. Pelangkat, about one mile eastward of Pandjang, is a low, wooded island; depths of less than 6 fathoms ($11^{m}0$) extend about 6 cables north-eastward from Pelangkat. All these islands lie on the western side of the usual route through Straat Durian.

A light is exhibited, at an elevation of 31 feet ($9^{m}4$), from a white iron light-beacon situated on the eastern side of Pelangkat.

Zuid (South) Passage islet (*Lat. 0° 43′ N., Long. 103° 39′ E.*) is situated about half a mile westward of Moro kechil (Little Durian) and is a bare islet, 213 feet ($64^{m}9$) high, which can be passed fairly closely. Perasi (North Passage islet), 147 feet ($44^{m}8$) high, lies about 2½ miles north-north-westward of Zuid Passage islet and is surrounded by a reef which extends about 1½ cables from its northern side. Both these islets lie on the eastern side of the fairway.

Mantaras, an islet 241 feet ($73^{m}5$) high, is situated about 6½ miles northward of Perasi and on the eastern side of the fairway; it is prominent from northward owing to the reddish colour of the rocks rising sheer from the sea. Mantaras kechil, about 3 cables north-north-westward of Mantaras, is a large rock with a couple of trees on it, and is surrounded by a reef which dries. Melvill rif lies about half a mile west-south-westward of Mantaras and dries. Itik consists of two islets, covered with vegetation, lying about one mile north-eastward of Mantaras, the southern being 160 feet ($48^{m}8$) high; a 3½-fathom ($5^{m}9$) patch lies nearly half a mile south-westward of Itik. Itik riffen are two reefs, which dry, and a rock awash, lying within a distance of one mile north-westward of Itik; the summit of Perasi in line with the eastern side of Mantaras leads westward of them. A coral reef, with a least depth of 16 feet ($4^{m}9$), lies about 3¾ miles north-north-eastward of the Itik riffen (chart 2403).

A light is exhibited, at an elevation of 31 feet ($9^{m}4$), from a white iron light-beacon, 26 feet ($7^{m}9$) in height, situated on the south-western side of Melvill rif.

Middelburg, a reef which dries, lies about 3 miles west-south-westward of Mantaras and on the western side of the fairway. A light is

Chart 2402.

exhibited, at an elevation of 31 feet (9^{m}4), from a white iron light-beacon situated on the north-western side of this reef. A 7-fathom (12^{m}8) patch lies about 6¼ miles northward of this light-beacon.

Directions for Straat Durian.—Vessels from southward, after passing Mutji (*see* Directions on page 234), usually shape course for Zuid Broeder. As a rule Djora, the summit of Moro besar (Great Durian), is first sighted and may be steered for bearing 346°; Zuid Broeder will usually be sighted in clear weather at a distance of about 20 miles.

The fairway through Straat Durian was swept, in 1933-34, at a depth of 46 feet (14^{m}0), and the axis of this swept area is indicated by pecked lines on charts Nos. 2402 and 2403. This area commences about 5½ miles southward of Zuid Broeder, and is about 5 miles broad there; from this position it trends northward for about 4 miles to a position 1¾ miles south-south-eastward of Zuid Broeder, where it bifurcates, one part passing westward of the Rukan eilanden and the other eastward of these islands; the western channel is about 1½ miles broad, and the eastern about 2 miles broad. Close west-north-westward of Noord Broeder the two channels unite again and trend west-north-westward, with a breadth of about 2½ miles, to Zuid (South) Passage islet; thence the channel narrows to about 2 miles and passes between Pelangkat and Perasi (North Passage islet), and between Middelburg and Melvill rif. Northward of the latter reef the channel again bifurcates; one branch, about 2½ miles broad, runs in a north-north-easterly direction to the southern entrance of Phillip channel (chart 2403), where it terminates; the other branch continues northward, with a breadth of about 2 miles, towards the entrance to Malacca strait.

Vessels taking the channel westward of the Rukan eilanden will avoid Richardson rif by keeping Perasi (North Passage islet) open eastward of Zuid (South) Passage islet (*Lat. 0° 43′ N., Long. 103° 39′ E.*).

Vessels making for Straat Durian from eastward, after passing through Straat Dempo, should pass southward of the Petong (Pitong) eilanden and then take care to pass clear southward of the shoal, with a depth of 4½ fathoms (8^{m}2), which lies about 7 miles east-south-eastward of Noord Broeder, *see* page 256. Manilang, which appears as a saddle from this direction, is a useful landmark for this purpose; by keeping this hill bearing 280° a vessel will pass nearly half a mile southward of the above-mentioned shoal.

Charts 2402, 2403.

Vessels bound for Phillip channel from the northern entrance of Straat Durian must take care to avoid the coral reef, with a depth of 16 feet (4^{m}9), lying about 3¾ miles north-north-eastward of the Itik riffen.

Vessels from northward can enter the strait without difficulty by keeping Perasi (North Passage islet) in line with Manilang, bearing 159°. Mantaras provides a useful landmark in the approach and is usually sighted first. *See* view facing page 251.

Charts 2402, 1355.

CHANNEL WESTWARD OF KUNDUR.—Dangers.—There is a channel westward of Kundur and Groot (Great) Karimun, leading into Malacca strait, and also into Straat Pandjang (Selat Panjang) and Straat Ajer Hitam (Selat Ayer Itam), or eastward into Singapore

Charts 2402, 1355.

strait by Straat Gelam. It is, however, encumbered with islets and reefs, and is, therefore, little used except by native craft and junks; a detailed description is given in the Malacca Strait Pilot.

The southern approach to this channel, between Durai (page 253) and the Sumatra coast, is clear, with depths of from 3½ to 5 fathoms ($6^{\mathrm{m}}4$ to $9^{\mathrm{m}}1$) in the fairway, except for a rock, with a depth of 2¾ fathoms ($5^{\mathrm{m}}0$), lying nearly 3¾ miles south-south-westward of Tanjong Batu Blian, the south-eastern extremity of Onggut (Ungar), *see* page 258. There are numerous submerged rocks southward of Onggut and Kundur; those southward of the former have been described on page 258. These rocks are all very small and are usually marked by tide-rips.

The southern coast of Kundur is low and the only prominent marks are the two hills of Gading and Tas (page 258). Depths of less than 3 fathoms ($5^{\mathrm{m}}5$) extend fully half a mile from the southern coast of Kundur, between Tanjong Sesop, its south-eastern extremity, and Tanjong Lubuh, its south-western extremity about 3½ miles west-north-westward. Batu Kidjang, a rock awash, is situated 2 miles east-south-eastward of Tanjong Lubuh and half a mile offshore. A 2¼-fathom ($4^{\mathrm{m}}1$) patch and a 5-fathom ($9^{\mathrm{m}}1$) patch lie, respectively, about 2¼ and 2 miles south-south-eastward of Tanjong Lubuh. There is a small islet, Bukit Djanggi, one mile south-westward of Tanjong Lubuh, and about one cable north-westward of this islet is a rock awash. A rock, with a depth of 3 feet ($0^{\mathrm{m}}9$) over it, lies about 2 cables westward of Tanjong Lubuh (*Lat. 0° 39′ N., Long. 103° 24′ E.*). Nearly 3¼ miles west-south-westward of Tanjong Lubuh there is a rocky islet covered with scrub.

On the southern side of this channel Tanjong Ungo, about 7¼ miles south-westward of Tanjong Lubuh, forms the eastern entrance point to the channel to Sungei Kampar, southward of Mendol, an island lying about 1½ miles westward of Tanjong Ungo. A spit, with depths of less than 3 fathoms ($5^{\mathrm{m}}5$) over it, extends eastward from the eastern side of Mendol to a position about 3½ miles north-eastward of Tanjong Ungo.

Tidal streams.—The tidal streams in the channel westward and southward of Kundur occasionally attain a rate of from 2 to 3 knots, the streams setting southward and south-eastward and in the opposite directions.

Charts 2402, 2403.

ISLANDS AND STRAITS BETWEEN STRAAT DURIAN AND STRAAT RIOUW.—Between Straat Durian and Straat Riouw there are numerous islands, islets, and reefs between which are the four straits, navigable for small vessels, Straat Sugi, Straat Sulit, Straat Tjombol (Chombol), and Straat Bulan.

Chart 2402.

Straat Sugi.—Islands and dangers.—Straat Sugi, the westernmost of these straits, lies between Moro besar (Great Durian), Sugi Bawah (Bawa) and Pandjang (Panjang) on the west, and Sugi on the east; it is easy to navigate, and is frequently used by small power vessels trading between Sungei Indragiri and Singapore. The western side of the strait is rendered unsafe by several reefs, but the eastern side, under the western coast of Sugi, is almost clear, and this coast

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

can be approached fairly closely nearly everywhere, bearing in mind that the coastal reef extends as much as a quarter of a mile in places and nearly half a mile off Tanjong Tello, *see* below.

Sugi is traversed from north-westward to south-eastward by a range of hills, and Bekaka, 1,000 feet ($304^{m}8$) high, the summit of the island, is a saddle-shaped peak situated nearly in the middle of this range. Tanjong Riouw (Riu), the southern extremity of the island, is cliffy, and an above-water rock lies about 2 cables westward of it; a narrow shoal, with depths of less than 5 fathoms ($9^{m}1$) and a least depth of 3 feet ($0^{m}9$) over it, extends nearly 2½ miles east-south-eastward from a position about 3 cables south-eastward of this point. Three 5-fathom ($9^{m}1$) patches lie about 2¾ miles south-westward, 1¾ miles west-south-westward and 1¾ miles west-north-westward of Tanjong Riouw (*Lat. 0° 45′ N., Long. 103° 49′ E.*). The village of Pasir is situated on the coast about 1¼ miles northward of Tanjong Riouw.

Tanjong Malang Tiang, about 3¾ miles north-westward of Tanjong Riouw, is a steep point with a hill, 554 feet ($168^{m}9$) high, close northward of it. Tanjong Tello, about 4¾ miles north-westward of Tanjong Malang Tiang, is rendered prominent by some trees on the coastal reef; a reef, with a depth of 1½ fathoms ($2^{m}7$), lies about 4 cables north-westward of the point, and a 3¾-fathom ($6^{m}9$) patch lies about three-quarters of a mile south-eastward of the point and a quarter of a mile offshore. Sugi is a village on the coast about 1¼ miles south-eastward of Tanjong Tello (*Lat. 0° 51′ N., Long. 103° 43′ E.*).

There are several islets in the strait. Telumas, about 3 miles north-westward of Tanjong Riouw, has a hill, 203 feet ($61^{m}9$) high, in the northern part, and is very prominent; a reef which dries, extends about 3 cables south-eastward from the southern extremity of the islet, and is prolonged for a further three-quarters of a mile south-eastward by a bank with depths of less than 5 fathoms ($9^{m}1$). A reef, which dries, lies about a quarter of a mile north-westward of Telumas. Tjonding (Chonding) kechil lies nearly one mile westward of Telumas, and is covered with high trees, so that it appears to be of the same height as Tjonding (Chonding) besar, 108 feet ($32^{m}9$) high, situated about a quarter of a mile west-north-westward of it; each islet is surrounded by a reef which dries, and depths of less than 5 fathoms ($9^{m}1$) extend nearly half a mile south-eastward from Tjonding kechil.

Pau is an island lying close off the middle of the eastern side of Sugi Bawah and nearly 3½ miles westward of Tanjong Malang Tiang; an islet lies close off the southern extremity of Pau, and a reef, which dries, extends about half a mile south-eastward from it. Sugi Darat, 134 feet ($40^{m}8$) high, lies about 4 cables east-south-eastward of the southern extremity of Pau, with Selerang between them. Sugi Laut is situated about 6 cables northward of Sugi Darat. Two reefs, which dry, lie about 3 cables eastward and 2 cables northward, respectively, of Sugi Laut. Kelontjing (Kelonching) is a small islet, surrounded by a reef, lying nearly 1½ miles north-westward of Sugi Laut. Two reefs, which dry, lie about half a mile south-eastward and a quarter of a mile west-south-westward, respectively, of Kelontjing. Murei, a small islet surrounded by a reef, is situated about 6 cables west-north-westward of Kelontjing. A 5-fathom ($9^{m}1$) patch lies about 2 cables south-eastward of Murei. Berdaun (*Lat. 0° 49′ N., Long. 103° 41′ E.*), an islet, lies on the southern end of a drying reef about one mile south-westward of

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

Murei. There is a drying reef about 2 cables west-north-westward of Berdaun and another drying reef about 6 cables south-eastward of the same islet and 2 cables offshore.

Djaga (Jaga) is a wooded island lying between Pandjang and the northern part of Sugi. The coastal reef extends about 4 cables from its northern side and about 2 cables from its southern side. There are three reefs, which dry, in the channel between this island and Pandjang; they lie about three-quarters of a mile south-south-westward, half a mile south-westward and 3 cables north-westward of the north-western extremity of Djaga. A shoal, with depths of less than 5 fathoms ($9^{m}1$), extends about one mile north-north-eastward from the northern extremity of Pandjang, and a reef, which dries, lies about 3 cables off the north-eastern side of this island and one mile eastward of its northern extremity. Manis, a wooded island, is situated nearly one mile northward of Djaga, and is surrounded by a reef which extends as much as 3 cables from its northern side, with a detached reef, which dries, close outside; this fringing reef extends, in places, up to 2 cables from the eastern and southern sides of Manis. Djangka, an islet surrounded by a reef, lies about three-quarters of a mile eastward of Manis and about 4 cables northward of Tanjong Djangka (Jangka), the north-western extremity of Sugi; an above-water rock lies on the fringing reef about one cable southward of the islet.

A shoal, with depths of from one to 5 fathoms ($1^{m}8$ to $9^{m}1$) over it, extends about 2¼ miles northward from the northern side of Sugi; near the northern end of this shoal are two reefs, which dry, two rocks awash, and a rock with less than 6 feet ($1^{m}8$) over it, the last lying fully 2¼ miles northward of Tanjong Djangka.

Directions.—Vessels can pass either eastward or westward of Telumas, taking care to avoid the reef which lies about a quarter of a mile north-westward of that islet; they can then proceed along the western coast of Sugi, giving Tanjong Tello a wide berth on account of the coastal reef, which extends south-westward from it, and the reef which lies about 4 cables north-westward of it. The usual route then lies between Djaga and Manis, or the passage between Manis and Djangka can be taken, bearing in mind that the coastal reefs extend a considerable distance from these three islands.

The channel westward of Tjonding besar (*Lat. 0° 47′ N., Long. 103° 45′ E.*) can also be taken; the summit of Zuid Broeder (South Brother) in line with Tanjong Batu Belobang, the north-eastern extremity of Moro besar, bearing about 172°, leads clear of all dangers.

Tidal streams.—The horizontal movement of the water in Straat Sugi is mixed with semi-diurnal tidal streams predominating; the maximum rate of the tidal stream is 3 knots.

Straat Sulit.—Islands and dangers.—Straat Sulit, between Sugi on the west, and Tjitlim (Chitlim) and Tjombol (Chombol) on the east, is of no great importance to navigation, as its southern entrance is almost closed by sandbanks with depths of less than 3 fathoms ($5^{m}5$) over them; the northern entrance is obstructed by several islands and reefs, but there are deep channels between them.

Tjitlim lies with its southern extremity nearly 6 miles eastward of Tanjong Riouw; except for the northern side, which is low, the coasts of the island are hilly. A narrow sandbank, which dries, extends about 2¾ miles north-westward from a position about 1¼ miles north-westward

Charts 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

of the southern extremity of Tjitlim; depths of less than 3 fathoms ($5^{m}5$) extend fully half a mile south-eastward from its southern end, and its northern end is connected to Tjombol by a spit, with depths of less than 3 fathoms ($5^{m}5$) over it.

Tjombol is separated from the north-western side of Tjitlim by Selat Mie, a narrow strait with a least depth of 2¾ fathoms ($5^{m}0$), bounded by marshy land on either side. The approach to the south-western entrance to this strait is across a bar, with a least depth of 1¼ fathoms ($2^{m}3$), about 1¼ miles north-westward of the southern extremity of Tjitlim and eastward of the above-mentioned sandbank. A range of hills rising to a height of 790 feet ($240^{m}8$) at the north-western end, runs through the middle of the island, with low ground on either side, but rising again near the coasts; there are, however, no prominent peaks. Linggakan, a small Malay village, is situated on the northern coast, about 3¼ miles east-south-eastward of Tanjong Kakong, the northern extremity of Tjombol.

A shoal, with depths of less than 3 fathoms ($5^{m}5$), extends nearly 2 miles south-eastward from a position on the coast about 1¼ miles north-eastward of Tanjong Riouw (*Lat. 0° 45′ N., Long. 103° 49′ E.*). A rock awash lies on the south-eastern end of this shoal. Ribung, Mengkadah, and Somo, lying, respectively, about 2 miles eastward, nearly 2½ miles east-north-eastward and about 2 miles north-eastward of Tanjong Riouw, are the more important of several islets on or near this shoal. A shoal, with depths of from 3¼ to 3¾ fathoms ($5^{m}9$ to $6^{m}9$), lies between half a mile and 1¼ miles south-eastward of Ribung. A shoal, with a depth of less than 3 fathoms ($5^{m}5$) over it, extends 1¼ miles south-south-eastward from a position about 1¼ miles eastward of Ribung. A similar shoal, with its northern extremity about 2¼ miles east-south-eastward of Ribung, extends 2½ miles south-south-eastward, and a depth of 3 feet ($0^{m}9$) lies on this shoal about three-quarters of a mile from its southern end. About 2¾ miles eastward of Ribung there is another shoal, with depths of less than 3 fathoms ($5^{m}5$) over it, which extends nearly 1½ miles southward. The dangers south-westward of these shoals are described on page 256.

Sepan lies in the middle of the southern entrance of the strait, and a shoal, with depths of less than 3 fathoms ($5^{m}5$) and a least depth of 3 feet ($0^{m}9$), extends about 1½ miles south-eastward from the southern extremity of the island. A 3-fathom ($5^{m}5$) patch lies about half a mile east-south-eastward of the southern end of this shoal.

Binga, an island, is situated close off the eastern coast of Sugi, with its southern extremity about one mile eastward of Sepan, and is separated from Sugi by a narrow channel. There is an unnamed islet about three-quarters of a mile northward of the northern end of Binga and a chain of drying reefs extend about a quarter of a mile south-eastward and one mile north-westward from this islet. Pait, an island, lies close off the north-eastern coast of Sugi about 3¾ miles north-westward of Binga, and a reef extends about a quarter of a mile from its southern end. The villages of Riouw (Riu), Sulit, Ladi and Beru Rawak are situated on the coast of Sugi opposite Pait. Lini, a small islet, lies about 3 cables northward of Pait. Lemas is situated nearly in the middle of the northern entrance, with its southern extremity about 6 cables north-eastward of Pait (*Lat. 0° 52′ N., Long. 103° 48′ E.*); it is fringed by a reef and there is an islet close off its north-eastern

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

side. A small shoal of sand and stones, with a depth of 1½ fathoms ($2^{m}7$) over it, lies about three-quarters of a mile east-south-eastward of the southern extremity of Lemas and about 3 cables off the western coast of Tjombol. A rock awash lies about 6 cables north-westward of the northern extremity of Lemas. Between this rock and Pasai (Passai), an island 603 feet ($183^{m}8$) high, lying close off the northern coast of Sugi, are two more rocks awash. These two rocks lie on a spit, with depths of less than 3 fathoms ($5^{m}5$) over it, extending about half a mile north-north-westward from Dulang, an islet lying about three-quarters of a mile westward of the northern end of Lemas. A drying reef and a rock awash lie within 3 cables south-eastward of Dulang. About a quarter of a mile south-westward of Dulang there is another island, Kebau.

Nibung and Nanas, two islets, are situated about half a mile and three-quarters of a mile, respectively, eastward of the northern extremity of Lemas. An unnamed islet, surrounded by a reef, lies about 2 cables southward of Nanas. Tjuping (Chuping) is an islet close northward of Nibung ; a reef extends about one cable from its northern extremity and a small islet lies close off its eastern side. Batu, another island, which lies about a quarter of a mile westward of Tjuping, has a fringing reef that extends nearly 3 cables north-westward from its north-western extremity. There is an islet close off the eastern side of Batu.

Bahan is situated close northward of Batu, and Duku, 150 feet ($45^{m}7$) high, close northward of Bahan and about 6 cables west-north-westward of Tanjong Kakong (page 266). Terang is a low islet about 6 cables north-westward of Tanjong Kakong ; a 3¾-fathom ($6^{m}9$) patch lies about a quarter of a mile north-westward of Terang. Badas is a hilly island, 121 feet ($36^{m}9$) high, lying about 3 cables north-eastward of Terang ; its northern extremity is fringed by a drying reef. A shoal, with depths of less than 5 fathoms ($9^{m}1$) over it, extends about three-quarters of a mile south-eastward from Badas. Two reefs, which dry, lie about a quarter of a mile and half a mile north-westward of Badas.

Sepatu (*Lat. 0° 55′ N., Long. 103° 46′ E.*) is a low islet lying nearly 2 miles westward of Badas, and is surrounded by a reef which extends fully half a mile from its western side ; a rock awash lies about 4 cables south-westward of Sepatu, and there is a 3¾-fathom ($6^{m}9$) patch about the same distance westward of this islet.

Foul ground, with drying reefs and some sunken rocks, extends about one mile north-westward from the northern extremity of Pasai. The dangers westward of this foul ground, extending northward of Tanjong Djangka (Jangka), have been described on page 265.

Directions.—Straat Sulit should only be used by small vessels with local knowledge. Such vessels, when entering the strait from southward, should pass between Mengkadah and Sepan, keeping the north-western extremity of the latter just clear of the eastern side of Mengkadah until past Mengkadah. Thence a vessel should steer so as to pass about a quarter of a mile north-westward of Sepan (*Lat. 0° 47′ N., Long. 103° 52′ E.*) ; and thence northward towards the coast of Tjombol, which should be followed at a distance of about 4 cables, taking care to avoid the 1½-fathom ($2^{m}7$) patch about three-quarters of a mile east-south-eastward of the southern extremity of Lemas.

Charts 2403, 2757, 1355, 2660a, 941a, 1263.

Chart 2402.

From this point she should proceed eastward of Nanas and Tjuping and between Duku and Terang, leaving the strait by passing northward of Sepatu, but taking care to avoid the 3¾-fathom ($6^{m}9$) patch about a quarter of a mile north-westward of Terang and the drying patches north-westward of Badas. Thence a vessel should follow the directions for Straat Tjombol (Chombol) given on page 272.

Charts 2402, 2403.

Straat Tjombol.—General remarks.—Straat Tjombol (Chombol), between Tjitlim and Tjombol on the south-west, and the south-western side of Bulan on the north-east, can only be used by small vessels with local knowledge; there are numerous reefs in the north-western part, and the tidal streams in the channels between them are strong. As the shortest route from Straat Karimata to Malacca strait is through Straat Dempo and Straat Tjombol, some vessels pass through the latter, but many of them have struck one or other of the numerous reefs.

Chart 2413.

Southern approach to Straat Tjombol.—Islets.—Dangers.—The southern approach to Straat Tjombol is bordered on the north-eastward by the coast of Rempang; for description of the western coast of Galang and dangers off it, *see* page 228. The island of Pandjang lies with its southern extremity about one mile west-north-westward of the western entrance to Straat Tiung (page 229) and about three-quarters of a mile off the western coast of Rempang. There is a small islet close off the southern extremity of Pandjang, whilst a shoal, with a least depth of 2½ fathoms ($4^{m}6$) lies close south-eastward, and a 2¾-fathom ($5^{m}0$) patch about one mile north-westward of the same point. In the passage between Pandjang and the coast eastward the depths are very irregular and the channel is almost blocked by a drying sandbank. Nibung, a small islet lying on a drying bank, is situated nearly one mile northward of Pandjang.

Tanjong Klingking, a sharp, rocky, and hilly point, is situated about 4¼ miles north-westward of Pandjang; the bight between these two places is shoal, with depths of less than 3 fathoms ($5^{m}5$). A 3-fathom ($5^{m}5$) patch and a 2½-fathom ($4^{m}6$) patch lie, respectively, about 2 and 3 miles southward of Tanjong Klingking.

From Tanjong Klingking the coast trends northward for nearly 3½ miles to the mouth of Sungei Akit; the village of Ajer (Ayer) Manti is situated on the coast about three-quarters of a mile north-westward of the mouth of Sungei Akit. Tanjong Tjolim, the north-eastern extremity of Rempang, forms the eastern entrance point of the northern entrance to a narrow strait separating Rempang and the hilly island of Setoko. The southern entrance to this strait, which is only available for praus, is shoal. Several drying patches and reefs lie in this strait.

Charts 2402, 2413.

Karang Mentema, an above-water rock on a drying reef, is situated about 1¾ miles southward of Tanjong Koroh (*Lat. 0° 55′ N., Long. 104° 04′ E.*), the southern extremity of Setoko. Trumbu Bernam and Trumbu Kubang, two drying reefs, lie, respectively, about one mile southward and 1¼ miles south-westward of the same point. Penjait Lajar (Laja), with its northern extremity about one mile westward of Tanjong Koroh, is fringed by a reef. An islet lies on a shoal, with depths of less than 3 fathoms ($5^{m}5$) over it, about 3 cables

Charts 2402, 2413.

northward of Penjait Lajar, and there is a drying reef close off the north-western extremity of the latter.

Kaloh, another island, is situated about a quarter of a mile southward of Penjait Lajar; depths of less than 3 fathoms ($5^{m}5$) extend for about 4¼ miles south-eastward from Kaloh.

There are several islands off the southern extremity of Tjitlim, and Serandjau (Seranjau), about 1¾ miles east-north-eastward of this point, is 351 feet ($107^{m}0$) high and is the largest and highest. A rock, with a least depth of 2 feet ($0^{m}6$) over it, lies about 3½ cables west-south-westward of the south-western extremity of Serandjau.

Some banks, with a least depth of 2¾ fathoms ($5^{m}0$), and several heads, with depths of 3 fathoms ($5^{m}5$) and less, extend southward from these islands towards Gull rock (page 228). Several detached patches, with depths of less than 5 fathoms ($9^{m}1$) over them, lie eastward of these banks. The area extending about 8 miles south-eastward, 7½ miles eastward and 3½ miles north-eastward from Serandjau contains many banks, with depths of from 2 to 5 fathoms ($3^{m}7$ to $5^{m}5$) over them, the positions of which are best seen on the chart.

Katip (*Lat. 0° 45′ N., Long. 103° 56′ E.*), the westernmost island of the group off the southern extremity of Tjitlim, lies about three-quarters of a mile south-westward of Serandjau; an above-water rock lies close northward and southward, respectively, of this islet. Kelawa, another islet, is about one mile east-south-eastward of Katip. An unnamed islet lies about 3 cables west-north-westward of Kelawa, and there are two above-water rocks within 2 cables east-north-eastward of it.

Sebai, the south-easternmost island of the group, is situated about three-quarters of a mile south-south-eastward of Serandjau. The channel between these islands is almost blocked by a large shoal of sand, with depths of less than 3 fathoms ($5^{m}5$) over it, and a drying reef lies on the south-eastern side of this shoal. The fringing reef extends fully 3 cables north-eastward from Sebai and there is an above-water rock a quarter of a mile eastward of its eastern extremity.

Resam, the easternmost island of the group, lies about 6 cables eastward of Serandjau. Shoal water extends about three-quarters of a mile north-north-westward from Resam and there is a drying reef at its outer end. A shoal, with a least depth of 2 fathoms ($3^{m}7$) over it, lies about 1½ miles eastward of Resam (*Lat. 0° 46′ N., Long. 103° 59′ E.*).

Pandan, the northernmost island of the group, is situated about one mile north-north-westward of Resam and is fringed by a reef which extends fully 2 cables in places. A shoal, with a least depth of 1½ fathoms ($2^{m}7$) over it, lies nearly 1¼ miles north-north-westward of Pandan; a 2-fathom ($3^{m}7$) patch and a 2½-fathom ($4^{m}6$) patch lie between this shoal and Pandan.

Depths of less than 5 fathoms ($9^{m}1$) extend for about 3½ miles north-north-westward from Pandan. A shoal, with a least depth of 3 fathoms ($5^{m}5$) over it, is situated about 3 miles east-north-eastward of Pandan.

Charts 2402, 2403.

Islets and dangers within the strait.—Bulan is generally low, except in the eastern part, where there is a range of hills rising to Bulan, the summit of the island, a conspicuous peak 731 feet ($222^{m}8$) high. Several islands lie close off the southern extremity of Bulan,

Charts 2402, 2403.

and the largest is Ladi, which lies about a quarter of a mile eastward of its southern extremity.

In the channel between Ladi and Bulan are the islands of Bukit, Bewak, and Rindjis (Rinjis). Tjungkul (Chungkul), 222 feet (67^m7) high, is situated about 2 cables southward of the southern extremity of Bulan; a 2¾-fathom (5^m0) patch lies about half a mile west-south-westward of Tjungkul.

Close southward of Ladi is the island of Selat Nenek. The islets of Luïng Darat and Awi lie close off the south-western and north-western sides, respectively, of Selat Nenek, and there is a 3-foot (0^m9) patch close off the southern extremity of the same island. An unnamed islet and two drying patches lie, respectively, about 4 cables, three-quarters of a mile and 1¼ miles east-north-eastward of the northern extremity of Selat Nenek. Pual (Puwal), an islet, is situated about 3 cables north-eastward of the north-eastern extremity of Ladi and two more islets lie close south-eastward and south-westward of it.

Luïng eilanden consist of several low islets lying south-eastward of Bulan; Luïng Laut, the outermost islet, is nearly 3 miles south-eastward of the southern extremity of Bulan. The northernmost islet, situated about one mile northward of Luïng Laut, has some conspicuous trees on it; there are two drying reefs about three-quarters of a mile eastward of the northern extremity of this islet, and two 3-fathom (5^m5) patches about one mile and 1½ miles eastward of it.

Two reefs, which dry, lie about 3 cables and one mile, respectively, north-westward of Luïng Laut and there is another reef, which dries, about 6 cables west-north-westward of this islet. A rock, with a depth of one foot (0^m3) over it, is situated about 3 cables north-westward of the north-western extremity of the westernmost of the Luïng eilanden. A spit, with depths of less than 5 fathoms (9^m1) and a least depth of 3¼ fathoms (5^m9) over it, extends about 7¼ miles south-eastward from the Luïng eilanden (*see* also chart 2413).

Tepekong is a small islet, 55 feet (16^m8) high, lying about 2½ miles west-north-westward of Luïng Laut (*Lat. 0° 52′ N., Long. 103° 58′ E.*) and a rock awash lies close south-eastward of it. A small shoal, with a depth of 2 feet (0^m6) over it, lies about one mile eastward of Tepekong, and there is a 4¼-fathom (7^m8) patch about half a mile north-westward of this islet.

Pisang is an islet, 236 feet (71^m9) high, situated about 2 miles west-south-westward of Tepekong and about three-quarters of a mile off the north-eastern coast of Tjombol; it is spherical in shape and is the most prominent islet in the strait. Two smaller islets lie close off its eastern side.

Several islets lie off the southern coast of Bulan; Bedari, situated about 2½ miles north-westward of Tepekong, and Bolah, about 4½ miles west-north-westward of Bedari, are the outermost of these.

Depths of less than 3 fathoms (5^m5) extend about 3 cables eastward from Bedari, whilst two above-water rocks lie half a mile eastward, and a large drying reef, with an islet near its south-eastern end, is situated about three-quarters of a mile east-north-eastward of the same island. A large drying reef lies about one mile east-south-eastward of Bedari, and depths of from 3¼ to 5 fathoms (5^m9 to 9^m1) extend about 6 cables south-south-westward and south-westward from this reef.

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2402, 2403.

A low islet lies about 1¼ miles north-westward of Bedari and close off the coast of Bulan, and there is a drying reef about three-quarters of a mile west-north-westward of this islet. A reef, which dries, is situated nearly half a mile westward of Bedari; a 3-fathom ($5^{m}5$) patch and a 6-fathom ($11^{m}0$) patch lie, respectively, nearly 2 cables southward and 6 cables west-north-westward of this reef. There are several reefs, which dry or are awash, within a distance of 1¾ miles south-eastward of Bolah, and fully three-quarters of a mile westward of this islet is a reef, which dries.

Semangka is a flat island lying about 2 miles southward of Bolah and nearly one mile off the northern coast of Tjombol; a reef, which dries, extends about one cable from its eastern and western ends. A detached reef, which dries, lies about 2 cables off the southern side of the island, and a rock awash lies about the same distance off the northern side. There is a rock awash about 1¼ miles south-eastward of Semangka and a quarter of a mile off the northern coast of Tjombol.

Badas, Terang and Sepatu, with the dangers in their vicinities, have been described on page 267.

Paloi is an islet, surrounded by a reef, lying about three-quarters of a mile north-eastward of Badas. A rock awash lies about half a mile south-eastward of Paloi, and there are two above-water rocks about 3 and 6 cables, respectively, north-westward of this islet.

Telan, Telok Bakau, and Terong, with two other islets and several reefs around, lie together in a group north-westward of Badas; Telok Bakau, the middle and largest island, lies with its southern extremity about 2 miles north-westward of Badas, and has a prominent tree on it. The dangers nearest the channel leading to Straat Tjombol are a 5-fathom ($9^{m}1$) patch about 1¼ miles east-south-eastward of the southern extremity of Telok Bakau, a rock awash about half a mile west-south-westward of the same point, and a group of three drying reefs between three-quarters of a mile and fully one mile westward of the same point.

Djangkat (Jangkat) (*Lat. 0° 58′ N., Long. 103° 43′ E.*), about 3½ miles west-north-westward of Telok Bakau, is an islet 103 feet ($31^{m}4$) high, lying nearly in the middle of a reef which extends as much as 6 cables north-westward from its northern side and about 4 cables south-south-eastward from its southern side. A drying reef lies fully three-quarters of a mile northward of Djangkat. There are several reefs midway between Djangkat and Telok Bakau; the nearest to the channel leading to Straat Tjombol lies nearly 2 miles south-eastward of Djangkat.

Kapala Djernih (Jernih) is an island lying about 2 miles westward of the western side of Bulan. Its north-western extremity, Tanjong Djernih (Jernih), 221 feet ($67^{m}4$) high, is precipitous and remarkable, whilst a 230-foot ($70^{m}1$) hill is situated near its southern extremity. The island of Kapala Gading lies close off the southern extremity of Kapala Djernih and four more islands, Katumba, Lotong, Geranting and Ladan lie, respectively, about half a mile and 2 miles westward, and 1½ and 2¾ miles west-north-westward of Kapala Gading.

Between the south-western coast of Kapala Djernih and Djangkat there are many drying reefs and shoal patches, the positions of which can best be seen on the chart. There is no safe passage between these islands.

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2402, 2403.

The strait between Kapala Djernih and Bulan is much encumbered with islets, drying reefs and sunken rocks and should not be attempted without local knowledge. In the southern approach the principal islets are Djello (Jello), 171 feet ($52^{m}1$) high, an unnamed islet, and the islet of Santo, lying, respectively, about 1¼ miles north-eastward, nearly one mile northward, and about 1¼ miles north-north-westward of Bolah. The small islet of Djeripit (Jeripit) is situated about 4 cables south-south-westward of Santo, and there are several drying reefs between this islet and Bolah. Between half a mile and 1½ miles north-north-westward of Santo are the islands of Semukit kechil, Semukit besar, and Tekkon. An islet and a drying reef lie within half a mile south-eastward of Semukit kechil, and there are several drying reefs and rocks within 3 cables of the north-eastern side of Tekkon. The area between Kapala Gading, Santo, and the Semukit eilanden is foul.

Petjom (Pechom), on the eastern side of the channel, and Dongdang, on the western side, lie, respectively, about 6 cables north-eastward and 4 cables northward of Tekkon. A drying reef extends nearly one mile southward and 4 cables northward from Petjom. The area westward of the Semukit eilanden and Dongdang is foul.

Tjuping (Chuping) is situated about 3 cables north-westward of Petjom. A rock awash lies about three-quarters of a mile northward of Tjuping, and two shoals, with depths of 23 and 26 feet ($7^{m}0$ and $7^{m}9$) over them, lie about half a mile and nearly one mile, respectively, north-north-westward of the same islet.

There is a rock awash nearly half a mile west-north-westward of Tanjong Kerang (*Lat. 1° 01′ N., Long. 103° 50′ E.*), the north-western extremity of Bulan.

Lumba besar, an island, lies northward of Bulan and is separated from it by Selat Batu Purap, an unimportant passage, much encumbered by rocks, which connects with Straat Bulan (page 273). A hill, 240 feet ($73^{m}1$) high, is situated about 6 cables south-eastward of Tanjong Belakis, the north-western extremity of Lumba besar, lying nearly 3 miles northward of Tanjong Kerang.

A group of islands, the largest being Ketepe, Seraja Tjundung (Seraya Chundung), Ampar, and Kasu, lie off the western side of Lumba besar. The westernmost islet of the group, Kera, is situated nearly 1¾ miles westward of Tanjong Belakis. Foul ground extends nearly three-quarters of a mile westward and about half a mile south-westward and north-westward from Kera. A drying coral reef lies about 1½ miles west-north-westward of Kera, and a 19-foot ($5^{m}8$) patch lies about 2 cables south-westward of Ampar. There are several passages between these islands and also northward of them, connecting with Straat Bulan, but they are much encumbered with reefs and islets.

Tandur (*Lat. 1° 02′ N., Long. 103° 48′ E.*) is situated about 2 miles northward of Dongdang and several islets lie close off the coast of Kapala Djernih between 1¼ miles southward and half a mile north-westward of Tandur. A drying reef lies nearly 1¼ miles north-westward of Tandur and about half a mile east-north-eastward of the village of Latjok, situated on the northern extremity of Kapala Djernih. The fringing reef extends nearly half a mile northward from that point. For Phillip channel, *see* Malacca Strait Pilot.

Directions.—Straat Tjombol is not recommended, and the north-

Charts 2757, 1355, 2660a, 941a, 1263.

Charts 2402, 2403.

western part is difficult to navigate ; the remarks given hereafter may serve to indicate the safest and easiest passage through.

From south-eastward, the strait can be entered with Pisang bearing about 307°, which leads, in a least depth of 3¾ fathoms (6^{m}9), over the shoals lying north-eastward of Resam. Pisang can be passed on either side, thence holding the Tjombol shore, and passing between that shore and Semangka, taking care to keep in mid-channel so as to avoid the reefs on either side. The vessel can then pass between Badas and Terang, keeping over to the Tjombol shore at first so as to avoid the shoal which extends south-eastward from Badas. When the north-western extremity of Badas bears 090°, course can be altered to pass northward of Sepatu, giving it a sufficient berth to avoid the surrounding reef. When Djangkat, which is easily identified, bears 322°, course can be altered to pass about a mile westward of it, and thence as necessary for Singapore or Malacca straits. Great attention must be paid to the tidal streams, which may attain a rate of 3 or 4 knots. Especial care is necessary in the north-western part of the strait, where the streams set in or out of the numerous side channels.

Approaching Straat Tjombol from north-westward, Djangkat will first be identified, and later the prominent tree on Telok Bakau. The directions just given may be followed in the reverse order.

A vessel approaching the northern entrance to Straat Tjombol from south-westward should keep the prominent tree on Telok Bakau in line with the summit of Bulan (page 269), bearing 077°, thus passing about half a mile northward of Itik riffen (page 261) and about 4 cables northward of the dangers extending from the northern sides of Sugi and Pasai (pages 265, 267).

Straat Bulan.—Straat Bulan is a narrow and tortuous passage which separates Bulan from Batam ; it is available for power vessels of moderate draught with local knowledge, and in conjunction with the passage between Abang besar and Petong, it is the shortest route between Palembang and Singapore. Straat Bulan is often used by small vessels wishing to avoid the bad conditions likely to be experienced in the eastern part of Singapore strait with strong north-easterly winds. The least depth in the fairway was 13 feet (4^{m}0), in 1951.

Numerous islets, much resembling each other, and continually being altered in appearance by cutting and burning, lie in the strait. The tidal streams may attain a rate of from 3 to 3½ knots, but no further details are known.

Directions. — Dangers. — Light. — Beacons. — Buoy. — There are no definite directions for Straat Bulan, and the remarks given hereafter are merely intended to indicate the usual route taken by vessels with local knowledge proceeding through the strait. Only those dangers which lie near the fairway are mentioned ; the positions of the remainder are best seen on the chart.

From southward, vessels can approach the strait by passing between the Luïng eilanden and Hang op (*Lat. 0° 52′ N., Long. 104° 02′ E.*), which consists of two small islets or rocks, surrounded by a reef, lying about 3¼ miles eastward of Luïng Laut (page 270) ; a narrow shoal, with depths of less than 3 fathoms (5^{m}5), extends about 3 miles south-eastward from Hang op, and a 3¾-fathom (6^{m}9) patch lies about 1¼ miles north-westward of the same islets. Course can then be shaped to pass midway between Sekikir, an island nearly 4½ miles

Charts 2413, 2757, 1355, 2660a, 941a, 1263.

Charts 2402, 2403.

north-north-eastward of Hang op, and a reef, which dries, lying about half a mile westward of it; depths of less than 3 fathoms ($5^{m}5$) extend about 1¼ miles southward from Sekikir, and similar depths extend about 3½ miles eastward from Ladi (page 270).

Chart 2403.

Course may then be steered towards Tanjong Gundap, situated about 2½ miles northward of Sekikir, passing about 2 cables eastward of Kurah kechil, which lies nearly 7 cables north-north-westward of Sekikir. Then the vessel should pass westward of the reefs which extend about 3 cables eastward from Noord (North) and Zuid (South) Pandjang (Panjang) eilanden, lying, respectively, about 1¼ miles north-westward and 1½ miles north-north-westward of Sekikir, and thence between Lajang (Layang) besar and Landjut (Lanjut), lying, respectively, about 1¼ miles northward and nearly 1½ miles north-eastward of Sekikir. Tanjong Gundap should be passed at a distance of about one cable with a north-westerly course, and when Aerlingsing, a hill 370 feet ($112^{m}8$) high, situated about 1½ miles eastward of Tanjong Gundap, bears 097°, keep this mark on astern, which leads close northward of a 13-foot ($4^{m}0$) patch lying about 6 cables north-westward of Tanjong Gundap and northward of a white iron beacon, surmounted by a ball, situated about one mile west-north-westward of that point; care must be taken that the vessel is on the above bearing before the eastern side of Lajang besar bears 175°, and, owing to the proximity of the coastal bank which extends from Batam, she must sound continuously. The white beacon stands on the north-western edge of a shoal, with depths of from 3 to 13 feet ($0^{m}9$ to $4^{m}0$), which extends about 1¼ miles south-eastward from the beacon.

The vessel should then pass about 2 cables southward of the Lembu eilanden, lying between 2 and 2¾ miles west-north-westward of Tanjong Gundap; thence about 2 cables westward of Buluh, situated about 5 miles west-north-westward of Tanjong Gundap (*Lat. 0° 59′ N., Long. 104° 00′ E.*).

There is a small pier, about 130 feet ($39^{m}6$) long, on the south-western coast of Buluh where small vessels can berth; a light, privately maintained, is exhibited from the head of this pier.

From abreast of Buluh a vessel should steer so as to pass between Bojan (Boyan) and Tengah, lying, respectively, about 6 cables west-north-westward and 2 cables north-westward of Buluh. A drying reef extends about 2 cables southward from Tengah and a rock, with a depth of 3 feet ($0^{m}9$) over it, lies about one cable northward of Bojan. Bojan is the headquarters of a Government official. The route then lies westward of Batu Hadji, a group of above-water rocks lying about 7 cables northward of Bojan; these rocks should be given a good berth as a rock, with a depth of 6 feet ($1^{m}8$) over it, lies about 2 cables south-south-westward of them, and a rock, with a depth of 5 feet ($1^{m}5$) over it, lies about a quarter of a mile west-north-westward of them. A black can buoy is moored close northward of the former rock, and close westward of an 8-foot ($2^{m}4$) coral patch, lying about 2 cables southward of Batu Hadji. A white iron beacon, surmounted by a ball, stands on a 3-foot ($0^{m}9$) patch about three-quarters of a mile north-north-westward of Batu Hadji, and the vessel must pass eastward of this beacon. A drying reef lies on the eastern side of the channel about 2 cables south-eastward of the beacon, and a rock, with a least depth of 5 feet

Chart 2403.

($1^{m}5$) over it, lies about 2½ cables south-south-westward of the same beacon. There are some brick kilns, rendered distinctive by their high chimneys, on the Batam coast eastward of this beacon.

The coastal reef which fringes the eastern shore should then be followed fairly closely, so as to pass eastward of two reefs, which dry, lying about 7 cables south-eastward and 5 cables east-south-eastward of the northern extremity of Melintang, an island lying with its southern extremity about one mile north-westward of Bojan.

Charts 3833, 2403.

The vessel should then pass between Pulau Lima, a group of islands lying between 1¼ and 2 miles north-north-westward of the northern extremity of Melintang, and Tanjong Untjang (Unchuk) (*Lat. 1° 06′ N., Long. 103° 53′ E.*), situated nearly 2 miles northward of the same point. A drying reef extends about one cable south-south-eastward from the southernmost of the Pulau Lima. Tanjong Untjang must not be approached closely as a rock awash lies about 1½ cables westward of it; the conspicuous summit of Bulan (page 269), bearing about 160°, should be kept open westward of Tanjong Untjang until about 3 cables past Tanjong Untjang so as to avoid this danger. Foul ground, with some drying reefs, extends about 8 cables north-north-eastward from the above-mentioned rock.

Charts 3838, 3833.

After passing Tanjong Untjang the vessel can steer for Mariam, a rocky islet lying on the western side of the northern entrance of the strait and nearly 3½ miles north-north-eastward of Tanjong Untjang. Kila and Djagung, two islets, are situated on a large drying reef on the north-western side of the channel about 1½ miles northward of Tanjong Untjang; a small drying reef lies about one cable south-eastward of Kila. The remainder of the fairway in this part of the strait is deep, except for a 29-foot ($8^{m}8$) patch which lies nearly 1¼ miles south-south-westward of Mariam.

Tanjong Pinggir, about 9 cables south-eastward of Mariam, is easily distinguished by a bare, conical hill on it. Some reefs, which dry, lie within a distance of 6 cables north-westward, and there is a small reef, with a least depth of one foot ($0^{m}3$) over it, about half a mile northward of Tanjong Pinggir. The passage out of the strait lies between the north-westernmost of the reefs off Tanjong Pinggir (*Lat. 1° 09′ N., Long. 103° 55′ E.*) and Mariam.

Vessels proceeding to Rede Pulu Sambo, about half a mile west-north-westward of Mariam, from Straat Bulan can use the channels on either side of Mariam; the western channel is only half a cable wide, with a depth of 6 fathoms ($11^{m}0$); the channel eastward and northward of Mariam is wider, but it should not be used by low-powered vessels, as the tidal streams are strong. A beacon, surmounted by a black truncated cone, marks the northern edge of the reef extending from the northern side of Mariam and a beacon, surmounted by a white ball, marks the southern edge of the reef extending from the southern side of Sambo, about 2 cables northward of the former beacon. For Rede Pulu Sambo and Singapore strait, *see* Malacca Strait Pilot.

Charts 2413, 2403.

Passage between Straat Bulan and Straat Riouw.—Dangers.—There is a passage leading eastward from Tanjong Gundap into Straat Riouw, and small power vessels with local knowledge from

Charts 2413, 2403.

Singapore sometimes use it in order to avoid strong north-easterly winds in the eastern part of Singapore strait.

From Tanjong Gundap (*Lat. 0° 59′ N., Long. 104° 00′ E.*), the route continues along the southern coast of Batam, passing northward of Au and Tonton, two islets lying about 1¼ miles east-south-eastward and nearly 2 miles eastward, respectively, of Tanjong Gundap, and thence between Asa besar and Anak Mati, lying, respectively, nearly 1½ miles eastward and about 2¼ miles east-south-eastward of Tonton. A rock, with a depth of 3¾ fathoms (6^{m}9) over it, lies about 4 cables north-eastward of the eastern extremity of Tonton, and another rock, with a depth of 3 feet (0^{m}9) over it, lies about half a mile north-north-eastward of the same point. Sheltered anchorage can be obtained close south-westward of Asa besar; the tidal streams here are very variable in direction and strength.

Vessels can then proceed between Tanjong Piaju, situated about 5½ miles eastward of Tanjong Gundap, and Awi, lying with its north-western extremity nearly 1½ miles eastward of Tanjong Piaju. The channel then turns north-eastward, passing between Sekenah and Momoi, lying, respectively, nearly one mile east-north-eastward and 1½ miles northward of Tanjong Piaju; and then between the islets of Bakau and Meregah, lying about 2 miles north-eastward and 2¼ miles north-north-eastward, respectively, of Tanjong Piaju; thence north-westward of Kubong (page 205), an island about half a mile north-eastward of Bakau. A drying reef lies on the eastern side of the channel within a quarter of a mile of the south-western extremity of Kubong, and a 4¼-fathom (7^{m}8) patch lies on the western side of the channel about three-quarters of a mile north-westward of the same point. From a position north-westward of Kubong a vessel should pass between Kasem and Lepang, lying, respectively, about 6 cables north-westward and 2 cables north-north-westward of Kubong. The latter islet can then be rounded, and a southerly course steered along the western side of Nginang (*see* page 204) and into Straat Riouw between this island and Pentjaras, following the Directions given on page 205 in reverse order.

Small vessels with local knowledge shorten this route by passing southward of Awi, thence north-eastward between the north-western extremity of Ajer Radja and the southern extremity of Kila (page 205), and thence eastward into Straat Riouw between Nginang and Pentjaras. There are, however, several reefs, with only narrow passages between them, in the channel between Awi and the northern extremity of Rempang, and several reefs and shoals lie in the bight between that point and Ajer Radja, the positions of which can best be seen on the chart. Foul ground exists north-westward of the imaginary line joining the south-eastern extremity of Awi and the southern extremity of Kila, and also extends northward for about 6 cables from the northern side of Ajer Radja (*Lat. 0° 58′ N., Long. 104° 09′ E.*).

Charts 2757, 1355, 2660a, 941a, 1263.

APPENDIX

*LIST OF PRINCIPAL PORTS, showing particulars of depths, &c.

PORT	Depth below chart datum level		Rise of tide.		REMARKS
	In channel of approach.	In anchorage.	Springs.	Neaps.	
			Feet.	Feet.	
COCOS ISLANDS:					
Port Refuge:					
Outer anchorage W.	Deep	7 fathoms	3·6	2·8	Good shelter from SE. winds. Poor shelter if wind or swell is northward of E.
Outer anchorage E.	Deep	8 fathoms			
Inner anchorage W.		9 fathoms			Good shelter but limited swinging room.
Inner anchorage E.		8 fathoms			
The Lagoon	Deep	4½ to 5½ fathoms			Eastward of Ujong Tanjong; for small vessels.
JAVA, WEST COAST:					
Rede Merak	5 to 8 fathoms	6 to 12 fathoms	2·2	1·5	Sheltered in both monsoons.
SUMATRA, SOUTH COAST:					
Pandjang	6½ fathoms	5 to 7 fathoms	4·2	3·2	Sheltered at all times. Mooring buoys.
BANKA:					
Rede Muntok	5½ fathoms from S.	5 to 12 fathoms	12·2	—	For large vessels.
	Deep from W.	23 feet			For small vessels.
Pangkal Pinang (*a*)	4 to 6 fathoms	3¼ fathoms	7·9	5·2	(*a*) N.W. of Karang Kapal. Calm weather only.
(*b*)	3 to 6 fathoms	3 fathoms			(*b*) Southward of Pandjang. During west monsoon.
(*c*)	4 to 6 fathoms	4 fathoms			(*c*) Between Gerek and Gosong. During east monsoon.
BILLITON:					
Tandjung Pandan (*a*)	Deep	8 fathoms	9·3	4·9	(*a*) Anchorage for large vessels of deep draught.
(*b*)	7 fathoms†	6½ fathoms			(*b*) Outer anchorage. Unsafe during west monsoon.
(*c*)		3¼ fathoms			(*c*) Inner anchorage. Good shelter in south-east monsoon. † A 4¼-fathom shoal lies in fairway of approach channel.

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* Vessels can anchor almost anywhere in the various straits described in this volume. There are no ports of any importance

*LIST OF PRINCIPAL PORTS, showing particulars of depths, &c.—*continued.*

PORT	Depth below chart datum level		Rise of tide.		REMARKS
	In channel of approach.	In anchorage.	Springs.	Neaps.	
			Feet.	Feet.	
SINGKEP:					
Dabo	6 to 8 fathoms	4 to 6 fathoms	6·7	6·6	Anchorage within 3-fathom line unsafe.
SUMATRA, EAST COAST:					
Rede Palembang	11 feet (Outer bar)	19 to 33 feet	(*a*) 13·8 (*b*) 9·4	— —	(*a*) Rise on outer bar; (*b*) rise at Palembang. Anchorage for vessels waiting to berth at wharves; good holding ground and ample swinging room.
Muara Sabak	3 feet (Outer bar)		11·2	10·9	24 feet alongside pier.
Rede Djambi	3 feet (Outer bar)		1·7	—	30 feet at floating pontoon jetty. 20 and 30 feet at oil wharves. Head of concrete pier dries. Meteorological conditions may cause a rise of 23 feet above chart datum at Djambi.
BINTAN:					
Tandjung Uban	Deep	14 fathoms	7·7	6·3	Five piers with depths of from 15 to 43 feet alongside for oilers. Small vessels can anchor closer inshore. Good holding ground in both anchorages.
Tandjung Pinang	6 fathoms decreasing gradually	Outer road 3 to 4¾ fathoms Inner road 2½ fathoms	5·7	4·5	Considerable sea with southerly and westerly winds. 7 feet alongside pier. Good anchorage for vessels not exceeding 12 feet draught.
Sungai Kolak	18 feet	6 to 9 fathoms abreast pier	6·3	5·1	25 feet alongside pier.

* Vessels can anchor almost anywhere in the various straits described in this volume. There are no ports of any importance.

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RELATING TO THE

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VOL. IV

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CORRECTED TO 1st SEPTEMBER, 1954

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ADVERTISEMENT TO SUPPLEMENT No. 1

This Supplement has been compiled by Captain F. J. B. Gibson, O.B.E., R.N., from information received in the Hydrographic Department of the Admiralty since the publication, in 1953, of the third edition of the Eastern Archipelago Pilot, Vol. IV.

This Supplement should be retained intact for reference ; its existence is to be entered on the tabular form inside the cover of the Pilot.

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A. DAY,
Vice-Admiral,
Hydrographer of the Navy.

Hydrographic Department,
Admiralty, London,
1st September, 1954.

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SUPPLEMENT No. 1, 1954

relating to the

Eastern Archipelago Pilot

VOL. IV

THIRD EDITION, 1953

(*Corrected to 1st September, 1954*)

Page viii.—Line 13: *Delete* " Gunung " to " Bintan) " and *substitute* " Groote Bintanberg "

Page xvi.—Line 20: *Delete* and *substitute* :—

" (*ii*) Prior to 1954, when a chart was corrected from information which was "

Line 22: *For* " is " *read* " was "

Lines 24, 33, 34: *For* " are " *read* " were "

Line 30: *For* " indicate " *read* " indicated "

Line 31: *After* " respectively " *insert* " , which would appear on later printings "

Line 35: *For* " may " *read* " might "

Line 38: *For* " does " *read* " did "

After line 38 *insert* :—

(*iii*) Since 1954, in order that more attention may be given to New Editions, Large Corrections and corrections by Notices to Mariners, and for other reasons, the making of minor corrections to Chart plates as in (*ii*) has been discontinued. Information of no importance to safe and convenient navigation is instead recorded for inclusion in the next New Edition or Large Correction; or, for promulgation in a later Notice to Mariners should a change of circumstance alter the importance of the information.

In consequence the small correction date enclosed in a rectangle does not appear later than 1953 on navigational charts. The date within brackets may still appear and is then an indication that magnetic compasses have been corrected for a change in Variation.

Page xvii.—Line numbers: *Insert* " *20* " and " *25* " against their correct lines, and *delete* incorrect numbers.

Page xix.—Line 48: *For* " in three volumes " *read* " as follows.—"

Lines 53-55: *Delete* " , radiobeacons " to " signals) " and *substitute* " and radiobeacons including air radiobeacons useful to ships; also stations giving QTG service and calibration stations "

Line 57: *After* " III " *insert* " (Part A) "

Page xx.—Line 2: *Delete* and *substitute*:—
" relevant codes.

Volume III (Part B).—Meteorological Observation Stations.

(*Note*: *Future editions of Parts A and B will be known as Volumes III and IV, respectively.*)

Volume V.—Comprises particulars of Radio time signals, Uniform time system, Navigational warnings and Position fixing systems (Decca, Loran, Consul, etc.)."

Page xxii.—Lines 54-55: *For* " astronomical " *read* " geographical "

Page xxiii.—Line 2: *For* " an astronomical " *read* " a geographical "
Line 11: *For* " astronomical " *read* " geographical "

Page xxviii.—Line 4: *For* " Volume II " *read* " Volumes II and V "

Page xxix.—Line 51: *For* " July " *read* " January "

Page 14.—*After* line 28 *insert*:—

Urgent signals from Dutch aircraft.—A Dutch aircraft having an urgent message to communicate to a vessel concerning the safety of another aircraft or vessel will pass the information by any method available. If unable to communicate otherwise, the aircraft will circle at least once over the vessel, fly low across the course of the vessel, close ahead, opening and closing the throttle or changing the pitch of the propeller, and then proceed in the direction of the distressed vessel or aircraft. Should the aircraft wish to indicate that assistance is no longer required she will cross the wake of the vessel, close astern, opening and closing the throttle or changing the propeller pitch. These signals may be repeated.

The vessel should acknowledge such signals by hoisting the answering pendant; flashing a succession of ' T's ' in the Morse code; and by altering course. Should she be unable to comply with the request for assistauce she should hoist flag ' N ' of the International Code of Signals, or flash a succession of ' N's ' in the Morse code.

Page 17.—Line 18: *For* " Vol. II." *read* " Vol. V.

LIFE-SAVING.—Lifeboats and Life-saving appliances form the principal means adopted for saving life.

The line-throwing apparatus, the principal life-saving appliance, can often be used with effect when a lifeboat is not available; its success, however, depends largely upon an intelligent co-operation on the part of the crew of the stranded vessel.

Signals.—In accordance with the International Convention for the Safety of Life at Sea, 1948, Chapter V, Regulation 16, the following signals shall be used by life-saving stations when communicating with ships in distress and by ships in distress when communicating with life-saving stations:—

Page 17 continued.

(*a*) *Replies from shore station to distress signals made by a ship* :—

Signal	*Signification*
By day.—White smoke signal *By night.*—*White* star rocket.	" You are seen—assistance will be given as soon as possible."

(*b*) *Landing signals for the guidance of small boats bringing away the crew of a wrecked ship* :—

Signal	*Signification*
(i) *By day.*—Vertical motion of a white flag or the arms. *By night.*—Vertical motion of a *white* light or flare. A range (indication of direction) may be given by placing a steady *white* light or flare lower and in line with the observer.	" This is the best place to land."
(ii) *By day.*—Horizontal motion of a white flag or arms extended horizontally. *By night.*—Horizontal motion of a *white* light or flare.	"Landing here highly dangerous."
(iii) *By day.*—Horizontal motion of a white flag, followed by the placing of the white flag in the ground and the carrying of another white flag in the direction to be indicated. *By night.*—Horizontal motion of a *white* light or flare, followed by the placing of the *white* light or flare on the ground and the carrying of another *white* light or flare in the direction to be indicated.	" Landing here highly dangerous. A more favourable location to land is in the direction indicated."

(*c*) *Signals to be employed in connection with the use of shore life-saving apparatus* :—

Signal	*Signification*
(i) *By day.*—Vertical motion of a white flag or the arms. *By night.*—Vertical motion of a *white* light or flare.	*In general*—" Affirmative." *Specifically* :— " Rocket line is held." " Tail block is made fast." " Hawser is made fast." " Man is in the breeches buoy." " Haul away."
(ii) *By day.*—Horizontal motion of a white flag or arms extended horizontally. *By night.*—Horizontal motion of a *white* light or flare."	*In general*—" Negative." *Specifically* :— " Slack away." " Avast hauling."

Page 18.—Line 11 : *For* " Article 28 " *read* " Article 17 "
Line 12 : *Delete* " Convention " to " 1926 " and *substitute* " Regulations "

Page 18 continued.

Lines 15-16 : *Delete* " fly " to " HP " and *substitute* " fly one of the two International Code groups HP or OIY "

Page 20.—Line 47 : *For* " tracts " *read* " tracks "

Page 22.—Line 21 : *For* " XXXV " *read* " XXXVI "

Page 45.—Lines 25-28 : *Delete* " Cooper's " to " ruins."
Lines 37-38 : *Delete* " one " to " beacon " and *substitute* " 1½ miles south-eastward of Possession point "
Lines 49-50 : *Delete* " with " to " line "

Page 46.—Lines 22-23 : *Delete* " one " to " beacon " and *substitute* " 1½ miles south-eastward of Possession point "
Lines 44-45 : *Delete* " with " to " line "

Page 48.—Line 18 : *For* " Vol. II " *read* " Vol. V "

Page 61.—Line 29 : *After* " buoy " *insert* " , surmounted by a ball,"
Line 30 : *For* " westward " *read* " south-westward "

Page 70.—Line 36 : *For* " 1¼ fathoms (2^{m}3) " *read* " 5 feet (1^{m}5) "

Page 72.—Line 37 : *After* " **Buoy.**—" *insert* " **Danger.**—"
After line 50 *insert* :—
A 5½-fathom (10^{m}1) patch lies, on the eastern side of the roadstead, about 2¼ miles east-south-eastward of Parasan light-beacon. A shoal, with a depth of 8¾ fathoms (16^{m}0) over it, lies about 8 cables eastward of Parasan light-beacon.

Page 73.—Lines 7-9 : *Delete* " In 1945 " to " below."
Lines 27-30 : *Delete* " western " to " *seconds* " and *substitute* " northern and north-eastern sides by two white conical light-buoys, exhibiting, respectively, a *white fixed* light and a *green fixed* light "
Lines 32-33 : *Delete* " *red* " to " *seconds* " and *substitute* " *red fixed* light "

Page 77.—Line 39 : *Add* :—This islet was in eruption, in September, 1953, causing a heavy rain of ashes.

Page 95.—Lines 32-33 : *For* " 6 fathoms (11^{m}0) " *read* " 37 feet (6^{m}3) "

Page 96.—Line 20 : *Delete* " sometimes "

Page 100.—Line 25 : *Delete* " A shoal " to " (8^{m}8) " and *substitute* :—
" The south-eastern corner of a shoal with a least depth of 33 feet (10^{m}1) "
Lines 28-30 : *Delete* " patch " to " patch." and *substitute* " corner ; a 36-foot (11^{m}0) patch lies about 2½ miles eastward of the south-eastern corner of the shoal."
Line 38 : *Add* :—A depth of 25 feet (7^{m}6) lies nearly one mile southward of the conspicuous tree.

Page 101.—Line 53 : *Delete* “ white ” to “ (3^{m}0) ” and *substitute* “ wooden structure, 13 feet (4^{m}0) ”

Page 105.—Line 30 : *For* “ 1952 ” and “ 11 feet (3^{m}4) ” *read* “ 1954 ” and “ 14 feet (4^{m}3) ”
Line 36 : *Delete* “ 13 ” to “ 1952 ” and *substitute* “ 14 feet (4^{m}3), in 1953 ”
Line 43 : *For* “ 1950 ” *read* “ 1954 ”

Page 107.—Line 17 : *Add* :—Vessels should not approach the light-vessel on a bearing more than 210°.

Page 108.—Line 6 : *Delete* “ *short* ” to “ *three* ” and *substitute* “ flash of *three seconds* duration *every twelve* ”

Page 114.—Line 18 : *Delete* “ The ” to “ buoys.” and *substitute* :—A black mooring buoy, No. 5, marks the southernmost of these rocks and is moored about one cable north-westward of Batu Merlang. A black mooring buoy, No. 6, marking the eastern side of the roadstead, is moored about one mile south-south-eastward of Tanjong Ruh.

Page 115.—Line 42 : *Delete* “ (Joe) ” to “ (88^{m}1) ” and *substitute* :—
“ 310 feet (94^{m}5) ”
Line 46 : *Delete* “ (Lalang) ”
Lines 47-53 : *Delete* “ The ” to “ Pasir ” and *substitute* :—Pulau Penjaman, and Pasir Keliling situated about three-quarters of a mile northward of the former, lie on a 6-fathom (11^{m}0) bank ; depths of less than 6 fathoms (11^{m}0) extend about one mile southward from Pulau Penjaman and about 3¼ miles east-north-eastward from Pasir Keliling ; a 3¾-fathom (6^{m}9) patch lies about three-quarters of a mile east-north-eastward of Pasir Keliling.

Page 116.—Lines 2-3 : *Delete.*
Line 5 : *For* “ 361 feet (110^{m}0) ” *read* “ 355 feet (108^{m}2) ”
Lines 7-13 : *Delete* and *substitute* :—
“ south-eastern extremity ; a 4½-fathom (8^{m}2) patch lies about one cable further eastward. A rock, awash, lies off the coastal reef about half a mile eastward, and a 2½-fathom (4^{m}6) patch lies about three-quarters of a mile north-westward, of the northern end of the island.”
Line 14 : *Delete* “ (Meranti) ” to “ (34^{m}1) ” and *substitute* “ , 129 feet (39^{m}3) ”
Lines 15-16 : *Delete* “ (Satoe) ” to “ 1½ ” and *substitute* “ , 119 feet (36^{m}3) high, is about 1¾ ”
Lines 18-19 : *Delete* “ similar ” to “ 3 ” and *substitute* “ depth of 2½ fathoms (4^{m}6) over it, about 5 ”
Lines 20 : *Delete* “ (Katjangang) ”
Lines 21-22 : *For* “ 538 feet (164^{m}0) ” *read* “ 556 feet (169^{m}5) ”
Lines 25-27 : *Delete* “ 1¼ ” to “ rock,” and *substitute* “ 2 cables southward and a 3¾-fathom (6^{m}9) patch lies about 1½ miles south-south-eastward of the north-western extremity of Pulau Pekatjong.”
Line 29 : *For* “ 120 feet (36^{m}6) ” *read* “ 178 feet (54^{m}2) ”
Line 31 : *After* “ rock,” *insert* “ 34 feet (10^{m}4) high,”
Lines 32-33 : *For* “ 1¼-fathom (2^{m}3) ” *read* “ 1½-fathom (2^{m}7) ”

Page 126.—Lines 20-24 : *Delete.*

Page 131.—Lines 48-51 : *Delete* " ; this " to " shoal "

Page 143.—Line 5 : *For* " **Buoy.**—" *read* " **Buoys.**—"
Line 27 : *Add* :—A white buoy is moored about 2½ miles westward of Karang Kapal, on the northern side of the entrance to Sungei Baturusa.

Page 146.—Line 2 : *For* " 33 feet ($10^{m}1$) " *read* " 50 feet ($15^{m}2$) "
Line 3 : *For* " 26 feet ($7^{m}9$) " *read* " 43 feet ($13^{m}1$) "

Page 149.—*After* line 38 *insert* :—
A shoal, with a depth of 16 feet ($4^{m}9$) over it, lies about 3¾ miles south-eastward of Iwan.

Page 157.—Line 38 : *For* " Slumar (page 151) " *read* " Slumar (page 155) "

Page 166.—Line 47 : *For* " 15 " *read* " 14½ "

Page 167.—Line 50 : *For* " 7½ miles north-westward " *read* " 7 miles west-north-westward "

Page 174.—Line 9 : *Delete* " **Buoy.**—"
Lines 15-16 : *Delete* " 1949 " to " dries." and *substitute* " 1953, dried for a distance of from a half to one mile westward of the river entrance points ; the channel across the drying bar and the entrance channel are marked by beacons."
Lines 29-40 : *Delete* and *substitute* :—
There are fishing stakes about 1½ miles northward of Tanjong Bawang (*Lat. 1° 47′ S., Long. 109° 55′ E.*) the southern entrance point of Sungei Kandang Karbau. The flats, within the 3-fathom ($5^{m}5$) line, off the mouth of the river, extend about 2¾ miles westward of the northern entrance point to Sungei Kandang Karbau, situated about 1¾ miles east-north-eastward of Tanjong Bawang ; the drying shore bank, across which the bar had depths of less than one foot ($0^{m}3$), in 1953, extends about 2¼ miles westward from that point. The bar is marked by two beacons, each surmounted by a white ball, the outer of which is situated about 2 miles westward of the northern entrance point.
Line 41 : *After* " Karbau " *insert* " , within the bar,"
Lines 42, 45 : *For* " four " *read* " two "
Line 43 : *For* " baskets " *read* " cylinders "

Page 177.—Line 10 : *Delete* " **Beacons.**—"
Lines 23-27 : *Delete* " The " to " westward."

Page 183.—*After* line 22 *insert* :—
A black can buoy is moored about 2½ miles north-eastward of Tanjong Padang Tikar.

Page 186.—Lines 41-44 : *Delete* " A black " to " kechil."

Page 190.—Lines 32-33: *For* "Gunung Bintan besar" *read* "Groote Bintanberg"
Line 33: *For* "Gunung Bintan kechil" *read* "Kleine Bintanberg"

Page 192.—Line 17: *Delete* "there" to "water" and *substitute* "Black rock, above water, lies"

Page 197.—Line 25: *Delete* "can"
Line 26: *Delete* "conical"
Line 34: *After* "($2^{m}7$)," *insert* "marked by a black can buoy,"

Page 200.—Lines 50-51: *Delete* ", and" to "part"

View facing page 200.—Top view; Legend and Title: *For* "Gunung Bintan besar" *read* "Groote Bintanberg"

Page 201.—Line 19: *For* "a" *read* "a black"

Page 202.—Line 6: *Delete* ", and" to "it"
Lines 26-27: *Delete* "a black" to "mile" and *substitute* "two black can buoys, moored respectively, about half a mile and 2 miles"
Line 42: *Delete* "*short*" to "*five*" and *substitute* "flash of *three seconds* duration *every fifteen*"

Page 204.—Line 41: *Add*:—It is marked by a white conical buoy surmounted by a ball.

Page 205.—Line 39: *After* "steep-to" *insert* "; No. 6 pier, 394 feet ($120^{m}0$) in length, is situated about half a cable southward of the five piers"
Line 42: *After* "($10^{m}4$)" *insert* "; No. 6, 13 feet ($4^{m}0$), in 1953"

Page 207.—Line 20: *For* "cone" *read* "truncated cone"
Lines 24-26: *Delete* "A black" to "klip."

Page 209.—Lines 4-5: *Delete* "It is" to "buoy."

Page 210.—Line 9: *After* "**Beacons.**—" *insert* "**Buoys.**—"
Line 24: *Delete* "three" to "cones" and *substitute* "two black can buoys and a black beacon surmounted by a cone"
Line 29: *For* "All four" *read* "Both"

Page 220.—Line 33: *For* "2½ fathoms ($4^{m}6$)" *read* "1½ fathoms ($2^{m}7$)"

Page 222.—Line 36: *For* "2 fathoms ($3^{m}7$)" *read* "1½ fathoms ($2^{m}7$)"

Page 229.—Line 23: *For* "*respectively*" *read* "respectively)"

Page 238.—Line 30: *For* "1952" *read* "1954"

Page 240.—Lines 25-26: *For* "similar beacon" *read* "beacon, painted black and white in vertical stripes"
Line 43: *After* "black," *insert* "passing eastward of it, (1954),"

Page 242.—Lines 29-30: *Delete* "; it is" to "unserviceable"

Page 283.—Black rock: *For* "190" *read* "192"

NEW AND ALTERED NAMES.

The following list gives new names and alterations in old names which will be adopted in all Hydrographic publications affected as opportunity occurs :—

New name	Page of Pilot	Obsolete name
Bintanberg, Groote . .	190	Gunung Bintan besar
Bintanberg, Kleine . .	190	Gunung Bintan kechil

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